

ANNALS of SURGERY

A Monthly Review of Surgical Science and Practice

Edited by

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CLINICAL CONSIDERATIONS OF THROMBOSIS AND EMBOLISM	193
JOHN A. VICTOR, M.D.	New York, N.Y.
INTRACRANIAL TUMORS AND HYDROCEPHALUS	199
WALTER E. DANDY, M.D.	Baltimore, Md.
LENGTHENING SOFT PALATE IN CLEFT PALATE OPERATIONS	208
GEORGE M. DORRANCE, M.D.	Philadelphia, Pa.
EPIGASTRIC PAIN A SYMPTOM OF ESOPHAGEAL OBSTRUCTION	212
PORTER P. VINSON, M.D.	Rochester, Minn.
IMPROVED GOITRE TECHNIC	215
JOSEPH L. DE COURCY, M.D.	Cincinnati, Ohio
HERNIA OF THE LUNG	220
J. G. MONTGOMERY, M.D., KANSAS CITY, MO., AND H. LAITZ, M.D., AGUSTA, KANT.	
SURGICAL TREATMENT OF DISEASES OF THE GALL-BLADDER	232
FRANK E. BUNTS, M.D.	Cleveland, Ohio
WANDERING SPLEEN WITH TORSION OF ITS PEDICLE	239
JOHN E. SUTTON, JR., M.D.	New York, N.Y.
SPONTANEOUS RUPTURE OF THE SPLEEN	246
MICHAEL G. WOHL, M.D.	Omaha, Neb.
DIVERTICULA OF THE JEJUNUM	250
NORMAN S. ROTHSCHILD, M.D.	Philadelphia, Pa.
APPENDICITIS AND TRANSPOSITION OF THE VISCERA	256
BYRD CHARLES WILLIS, M.D.	Rocky Mount, N. C.
LIGATION AND DEEP TREATMENT OF APPENDECTOMY STUMP	260
JOHN J. MALONEY, M.D.	Cincinnati, Ohio
HERNIA OF THE BLADDER	264
ROBERT E. FARE, M.D. AND CLARENCE W. BRUNKOW, M.D., MINNEAPOLIS, MINN.	
GRANULOMA INGUINALE	273
R. RUSSELL BEST, M.D.	Omaha, Neb.
CYSTS OF THE ILIO-POAS BURSA	275
WILLIS D. GATCH, M.D. AND W. T. GREEN, M.D.	Indianapolis, Ind.
VERTEBRAL EPIPHYSITIS	286
PHILIP LEWIN, M.D.	Chicago, Ill.
DISLOCATIONS OF THE SEMILUNAR CARPAL BONE	289
H. EARLE CONWELL, M.D.	Fairfield, Ala.
ARTERIOVENOUS FISTULA	296
THOMAS HERBERT THOMASON, M.D.	Fort Worth, Texas
TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY	301
STATED MEETING HELD APRIL 5, 1925	
CORRESPONDENCE: Koster: Closure of Duodeno-Jejunal Fistula	309
Torsion of Great Omentum. O'Coner: The Treatment of Abdominal Spasms	310
BOOK REVIEWS: Wilson and Cochrane: Fractures and Dislocations. Beck: The Crippled Hand and Arm. Davis: Applied Anatomy. Carson: Modern Operative Surgery	318

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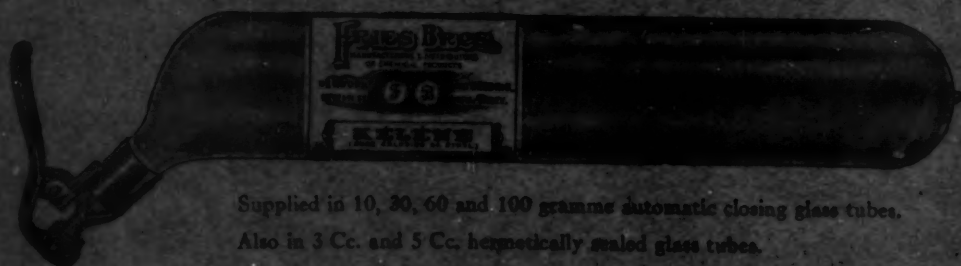
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ANNALS *of* SURGERY

VOL. LXXXII

AUGUST, 1925

No. 2

CLINICAL CONSIDERATIONS OF THROMBOSIS AND EMBOLISM*

BY JOHN A. VIETOR, M.D.
OF NEW YORK, N.Y.

THE technic of surgery of the present day has advanced to such an exact science that with certain types of operations for certain conditions the post-operative results can be tabulated and recited in terms of percentage. However, there are circumstances which tend to mar these figures and to cause the results to be poorer than the purely technical procedure would indicate. There are accidents which must be seriously considered, which at the present time cannot be discounted and which also cannot be foreseen. Among these accidents thrombosis and embolism are still potent factors as post-operative complications and occur far too often to allow them to be disregarded.

In studying the subject from its early times certain names stand out as epoch-making periods in the theoretical conception of its so far unknown etiology. Virchow's classical work in 1846 to 1856 first pointed out the importance and significance of the slowing of the blood stream as an etiological factor. Following Virchow, Zahn in 1872 first launched the theory that thrombi were due to a localized clumping of the leucocytes, with a secondary fibrin deposit. Eberth and Schimmelbusch later changed this conception to that of the platelet origin. After the study and increased knowledge of bacteriology Vidal and Vasquez ascribed the cause of thrombi to microorganisms as numerous cultures showed microorganisms to be often present in the clot. In 1909, Welch classified and described various types to thrombosis depending on their histological origin; the leucocytic thrombi occurring around acutely infected areas, the fibrinous in the smaller vessels in the hepatized areas of the lung in pneumonia and the hyalinized type from the fibrillated fibrin or coalesced erythrocytes and possibly with leucocytes. Conner reviewing the subject in 1913, emphasized the importance of the relation of the coagulation of blood to the action of the calcium salts and their relationship to prothrombin. He maintained that there was no great increase in the number of platelets, which Wright, of Boston, had discovered clung to the side of the vessel wall as a forerunner to coagulation.

Aschoff's conception that not one condition alone, but a "function of a number of variables," was responsible, is at the present time the most widely accepted theory. These variables are: (1) Changes in the blood plasma, *i.e.*, diminished or increased coagulability; (2) changes in the blood elements, *i.e.*, increased or decreased powers of agglutination; (3) changes in the

* Read before the New York Surgical Society, April 22, 1925.

blood flow, *i.e.*, changes in the rate, the formation of eddies, etc., and lastly changes in the vessel wall itself.

In regard to the etiology, Aschoff believes that important changes in the morphological blood constituents precedes the occurrence of fibrin coagulation. What these changes are at the present time is not understood.

Experimentally various types of thrombosis have been produced by many various methods using foreign bodies, poisons, sera, chemicals, bacterial toxins, tissue extracts, etc., to produce the various types. These experiments led Aschoff to his conclusions that the slowing of the blood stream plus the alteration of the blood elements themselves, especially the platelets, were the chief factors in the production of thromboses.

That infection plays a very definite rôle as an etiological factor cannot be denied. It has been well known for years that thromboses arise in the tissues adjacent to an inflammatory area, and it is also undisputed that due to an infective process thromboses arise in parts far distant from the inflamed area as instanced in the phlebitides of typhoid fever.

Post-operative thromboses manifest themselves in certain localities after certain processes. The veins of the leg, the femorals and the pelvic veins are the most frequent sites clinically. Here, the supine position of the patient allows retardation in the veins of the lower extremities, the femorals lie close under Poupart's ligament and the left iliac vein by its anatomical position is compressed by the arterial trunks, thus all tending to retard the blood stream. Accompanying this retardation of the blood stream there is in a great majority of cases a low-grade infection.

Whether or not the post-operative pneumonia or pneumonitides are embolic in character is still a matter of conjecture, although apparently this theory is becoming more and more generally accepted. Certainly the fact that numerous cases arise after local or regional anæsthesia would tend to make one believe that some, at least, can be classified as embolic. Consequently, if it is possible to decrease the occurrence of thrombosis and embolism, it is reasonable to suppose that certain of these pneumonias may be avoided.

The characteristics of these post-operative pneumonias also suggest their embolic character. They vary to a great extent from the typical so-called medical pneumonias. They occur from the first to the fourth day after operation, are ushered in by a rise of temperature from 102 to 103, a dry hacking cough with expectoration rarely rusty or blood-tinged, and a slight rise in the pulse and respiratory rate. On physical examination the patient rarely appears cyanotic or in great distress, tactile fremitus may be increased and there may be small areas of dullness with fine crepitant râles usually heard over the lower posterior chest. Exploratory puncture frequently reveals small amounts of slightly blood-tinged fluid. The X-ray picture showed a typical bronchial pneumonia. The course of this type of pneumonia is, as a rule, from three to four days resolving by lysis with a gradual clearing up of physical findings.

THROMBOSIS AND EMBOLISM

In regard to fatal pulmonary embolism which may be the end result of thrombosis, little more is known of its etiology. On account of the size, shape and diameter of the embolus as found at autopsy, Aschoff believes that it is always from the femoral vein, although possibly a pelvic phlebitis may exceptionally be the starting place. Clinically, many conditions have been suggested as aiding in its occurrence; namely, faults in the patient, faults in the operative technic, and faults in the operative care.

I have collected and studied the cases of fatal pulmonary embolism occurring on the second surgical division of the New York Hospital for ten years, from January 1, 1915, to December 1, 1924. They are stated in the following table:

TABLE I

No. of operations	12,615
No. of emboli	21
Average time of occurrence	13 days after operation
Shortest time	16 hours after operation
Longest time	47 days after operation
Average age of patient	43 years

Operations	No. of cases	Days after operation
Salpingitis	1	47
Myomectomy	1	2
* Watkins Wertheim	2	18, 16
Hypert. prostate	1	15
* Gall-bladder	6	16 (hrs.), 1, 7, 10, 25, 31
* Chr. appendicitis	3	4, 7, 12
* Hernia	2	7, 11
Acute appendicitis	1	3
* Ca. of pancreas	1	31
* Ca. of œsophagus	1	17
* Sarcoma of chest wall	1	14
* Fracture of patella	1	8

* Autopsy obtained.

Autopsies were obtained in nine cases and showed a thrombosis of the femoral vein in four cases. In one case there was a thrombosis of the common iliac vein and the inferior vena cava. Two cases a wound inspection was only allowed so the condition of the femoral veins was undetermined. In the remaining two cases, while a complete autopsy was performed, no existing thrombosis could be demonstrated.

It will be noted from the above chart that those cases that died of a pulmonary embolus gave no clinical sign of a preëxisting phlebitis or thrombosis except in the case of carcinoma of the pancreas. In this case the patient had a hopeless condition and was gradually dying of a metastatic growth in his liver. On his thirteenth post-operative day a swelling of his left leg was first noted and on his twenty-seventh day he had a hæmiplegia. He died on the thirty-first day after his operation from apparent cachexia, but at autopsy a large pulmonary embolus with thrombosis of the common iliac and

JOHN A. VIETOR

inferior vena cava was revealed. One case of inguinal hernia complained of a pain in his right leg on his third post-operative day, but periodic examination was negative for clinical evidence of a phlebitis. He died on the eleventh day and at autopsy showed a thrombosis of the right femoral vein.

Heard, quoting figures from the Mayo Clinic from 1912 to 1920, cites 104 cases of fatal pulmonary emboli following 125,164 operations or one to 1203, an average of 0.08 per cent. In this series resection of the rectum gave the largest mortality, 549 operations and 3 fatalities from emboli or 1 to 183. Abdominal hysterectomy was second, 3751 cases and 18 pulmonary emboli or 1 to 208. It is of interest that in both these series the occurrence of pulmonary emboli is insignificant in cases in which the abdominal cavity was not opened.

Schilling in Germany collected 32 cases over a period of 12 years, giving a percentage of 0.12 per cent. Ten of these cases occurred after a local anæsthetic.

The symptoms of large pulmonary emboli are too well known and the diagnosis too self-evident to require any description or elaboration. Treatment is, as a rule, valueless, but cardiac stimulants should be avoided on account of the danger of dilatation of the right heart. Trendelenburg has operated for pulmonary emboli on animals, but the literature fails to reveal any successful operation on humans. Supportive measures rarely give relief, although occasionally cases which clinically give the picture of a pulmonary embolus do recover.

In reviewing the number of cases diagnosed clinically as phlebitis occurring on the same service during the past ten years, there was a total of 34 cases, or approximately 1 in 330. These cases occurred after the following operations:

TABLE II

No. of cases	Days following operations
Fibroid uterus	3
Retroversion	11, 15, 14
Salpingitis	13
Ovarian cyst	14
Intra-ligamentous cyst	8
Puerp. sepsis (no op.)	9
Pelvic abscess	14
Ca. of the rectum	21
Acute appendicitis	22
Chronic appendicitis	14, 15, 25, 14, 29
Varicose veins of leg	24, 39, 20, 20, 14, 22
Hernia	14, 8, 6
Gunshot wound of abdomen... 1	13, 3, 24, 27, 11
Abscess of leg	23
Ca. of pancreas	9
Ulcer of duodenum	31 (died of pulmonary embolus)
Abscess of mammary gland.... 1	12
Average number of days.....	9
	15

THROMBOSIS AND EMBOLISM

Compared with the cases dying of a pulmonary embolus which showed no phlebitis clinically, it is of great interest to note that of the 34 cases in which a definite phlebitis was diagnosed only one of these had a fatal outcome. Consequently, prophylactic measures tending toward the avoidance of thromboses and emboli should be instituted in order to decrease as much as possible the untoward complications. Various and numerous measures have been suggested; *first*, as to patient; experimentally it has been shown that thromboses occur more readily in rabbits in poor general condition than in healthy ones, so have a patient in good general physical condition if possible. Remove foci of infection as carious teeth, diseased tonsils or infected sinuses, etc. Increase the body fluids by giving water by mouth or rectum or by other methods. *Second*, technic of operation. The position of the patient on the operative table has been a matter of study by numerous observers and various suggestions offered. A position which would tend to temporarily decrease the blood circulation by pressure or obstruction to the venous return should be avoided. The Trendelenburg position has been the subject of condemnation and the overstretching of the spinal column in gall-bladder operations has likewise been condemned. While operating many good suggestions have been brought forward; the avoidance of strong pull on abdominal retractors as emphasized by Clark, care in ligating, the poor control of stasis, traumatization of tissues, too tight suturing and the too free use of cutting needles.

In the post-operative care many further valuable suggestions, which if religiously carried out, might lessen the occurrence of thrombi and emboli. Systematic exercises as advocated by Pool in 1913, which, while affording to the individual patient only such exercises that he or she is able to perform, is a suggestion in the right direction, but unfortunately little followed. The proper care of the intestinal tract to avoid straining of hard-formed faeces is important. Some authors attribute the dislodgment of a clot to the passage of hard faeces through the sigmoid and rectum over the iliac vessels. Allowing the patient up as early as the fifth post-operative day has also been advocated by some, but it would seem that there are too many other possible complications which would mitigate against the possible advantages gained.

Experimentally Hirudin checks coagulation of rabbit's blood for a period of hours, and Mason in Detroit has prepared tissue extracts with the same end in view. While it would seem impossible to determine in which cases anti-coagulants might be of value, these would be contra-indicated where the danger of oozing after an operation is a serious one.

CONCLUSIONS

(1) Definite etiology of thrombosis is as yet not fully understood. While due to a "function of a number of variables," two main causes stand pre-eminently forward, changes in the blood plasma, and slowing of the blood stream.

(2) Infection is one process which definitely causes thromboses.

(3) Many post-operative pneumonias are probably embolic in character.

JOHN A. VIETOR

(4) Fatal pulmonary emboli usually occur without warning and without clinical evidence of a preëxisting thrombosis.

(5) Definite prophylactic measures should in all cases be instituted in the hope of avoiding thrombosis and embolism.

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INTRACRANIAL TUMORS AND ABSCESES CAUSING COMMUNICATING HYDROCEPHALUS

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FROM THE JOHNS HOPKINS UNIVERSITY AND HOSPITAL

IN EARLIER publications it has been shown that practically all cases of chronic hydrocephalus * are caused by a block at some point in the system of spaces in which cerebrospinal fluid circulates. This block, however, is constant neither in character nor in location. A varied assortment of obstructions includes congenital defects and malformations of or affecting the cerebrospinal spaces, congenital and acquired strictures, inflammatory obliteration of the subarachnoid space, tumors, abscesses, tubercles, etc. But regardless of the intrinsic character of the underlying lesion, and regardless of its location, the effect is always precisely the same—a reduction in the absorption of cerebrospinal fluid. The various clinical and anatomical differences in the expression of hydrocephalus, though interesting, are of no fundamental significance. They are but expressions of an underlying cause.

In every case of hydrocephalus the causative lesion can now be demonstrated not only at necropsy, but during life by clinical tests, and most of them could be found, if need be, at operation. Such being true, there is no longer justification for referring to hydrocephalus as "idiopathic."

It is convenient and useful from the standpoint of therapy to subdivide hydrocephalus into two types: (1) *with* communication and (2) *without* communication, depending upon whether or not the lateral cerebral ventricles are in communication with the spinal subarachnoid space. This differentiation of type is easily made by injecting a cubic centimetre of neutral phenol-sulphonephthalein into the spinal canal and testing for the color in the ventricular fluid fifteen to twenty minutes. The presence of the dye in the ventricular fluid at once eliminates the existence of any obstruction within the ventricular system and places it in the subarachnoid space (usually the cisternæ)—communicating hydrocephalus. If the dye does not appear in the ventricular fluid the obstruction must be located at some point in the ventricular system (non-communicating hydrocephalus). Fundamentally, of course, these two types are alike; they differ only in the location of the obstruction. It may be noted in passing that occasionally there are two

* The qualification "practically" is used because of a possibility that thrombosis of the vein of Galen, or its closure from other cause, may result in a continuous formation of fluid. We were able to induce a low-grade hydrocephalus in a dog by a ligature so placed on the vein of Galen that an adequate venous collateral circulation failed to develop. If such a venous obstruction occurs without other complications and causes hydrocephalus in human beings, it must be exceedingly rare. In every necropsy we have carefully inspected the vein of Galen and it has always been patent.

obstructions, both of which may be in the ventricular system, such as at the aqueduct and the basal foramina, or one may be within the ventricular system and the other in the cisterna.

This paper is concerned only with the etiology of the communicating type

of hydrocephalus. In previous reports on this subject we have observed only post-inflammatory adhesions and one case of congenital mal-development of the subarachnoid space as the cause. In this paper two additional types of lesions are presented — namely tumors and abscesses, or more correctly, the reaction about abscesses. That at least one of the communicating foramina (Magendie and Luschka) at the base of the brain was patent during life, has been shown by the phenolsulphonephthalein test, and at necropsy both by inspection of

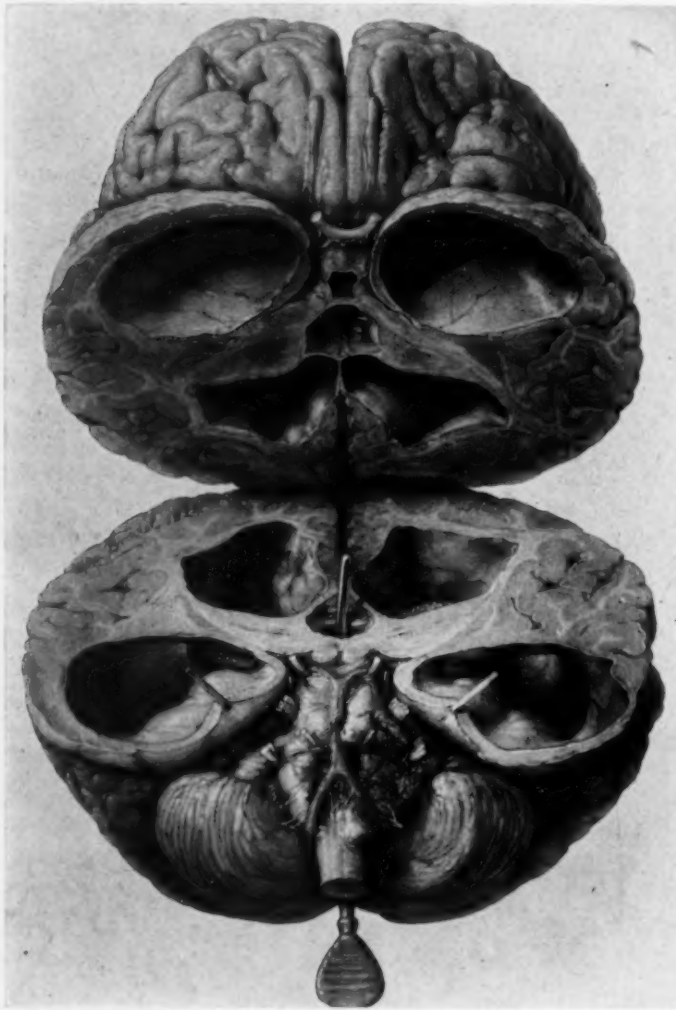


FIG. 1.—Drawing by Mr. Brödel of the brain in Case I. The tumor can be seen covering the entire ventral surface of the brain-stem. The tumor is a direct outgrowth from the brain tissue. The various nerves pierce the tumor or skirt its edge. Curiously, no nerve palsy had resulted. The large probe passing through the foramen of Magendie, fourth ventricle, and aqueduct of Sylvius, into the dilated third ventricle, shows that the tumor has produced no obstruction in the ventricular system. The tumor has pushed the basilar artery away from the brain-stem; in one place near its centre the artery is partly covered by the tumor.

these foramina and by the passage of ink into the fourth ventricle. In one patient, an infant, an infiltrating glioma (possibly of congenital origin) covered the ventral surface of the pons and medulla (Fig. 1); in another, a boy of six, the lesion was also a glioma and quite similarly placed (Figs.

INTRACRANIAL TUMORS AND HYDROCEPHALUS

3, 4 and 5); and in a third infant two symmetrically placed abscesses at the tip of each temporal lobe were connected by a dense bridge of inflammatory tissue (Fig. 7). In each instance the location of the obstruction and its impermeability were demonstrated by intraspinous injections of India ink (under pressure) before the necropsy was begun. In no instance did the color pass the block. In cross-section, each lesion involved the entire exposed ventral and lateral surfaces of the brain-stem, thereby obliterating peripheral as well as central portions of the cisternæ.

CASE I.—A baby of five months, referred by Dr. J. G. Lemmon, of Akron, Ohio, exhibited no unusual features of hydrocephalus (Fig. 2). Birth was at term; the delivery was spontaneous and easy. The infant thrived after birth and at three and a half months was able to hold up its head; but at four months it was brought to Doctor Lemmon because "it did not seem so well." The enlargement of head was first noticed at that time and progressed rapidly, it was no longer able to hold up its head. There had never been a history of an acute illness, of paralysis or convulsions. The anterior fontanelle was large, bulging and tight, all cranial sutures were widely separated. Head measured 46.5 cm., in circumference. No asymmetry or other abnormalities could be seen.

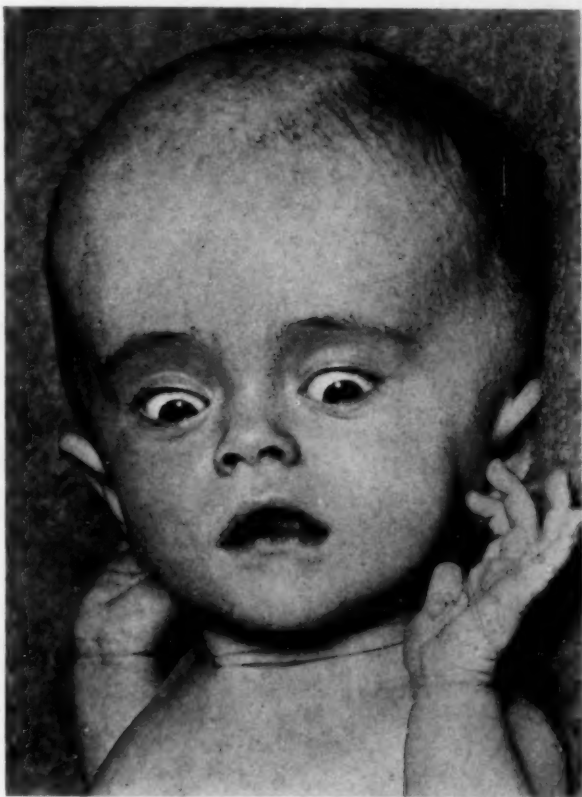


FIG. 2.—Patient (Case I) showing hydrocephalus caused by the tumor arising from the brain-stem. (Fig. 1.)

Phenolsulphonephthalein test: one cubic centimetre of phenolsulphonephthalein was injected into the lumbar spinal canal. After twenty minutes fluid was aspirated from a lateral ventricle and showed the dye in concentration which matched a 20 per cent. standard colorimeter solution; two hours later the color had increased so that undiluted it matched an 80 per cent. standard solution. After three hours, 8 per cent. of the phthalein was recovered from the urine (spontaneous voiding). A second specimen of urine obtained three hours later contained an equal amount.

It was evident, therefore, that we were dealing with a case of communicating hydrocephalus. There was no reason either from the history, examination, or clinical tests, to suspect a tumor as the obstructing lesion. A few hours following removal of the choroid plexus (through a ventriculoscope) the patient died. When the occipital lobes were exposed no fluid was found in the subarachnoid space of either side.

Necropsy showed a diffuse glioma involving most of the ventral and lateral surfaces

of the pons and medulla (Fig. 1). Both foramina of Luschka were occluded but the foramen of Magendie was patent. The aqueduct of Sylvia and the third and fourth ventricles were greatly enlarged. The lateral ventricles were greatly enlarged.

India ink injected at the beginning of the necropsy passed freely into the lateral ventricles but stopped sharply at the caudal margin of the tumor underlying the brain-stem. The accompanying drawing by Mr. Brödel (Fig. 1) graphically demonstrates the patency of all the ventricular channels (the large probe passing through the iter, fourth ventricle, the foramen of Magendie) and the high grade of hydrocephalus of the lateral ventricles.

CASE II.—A colored boy of six years entered the Johns Hopkins Hospital because

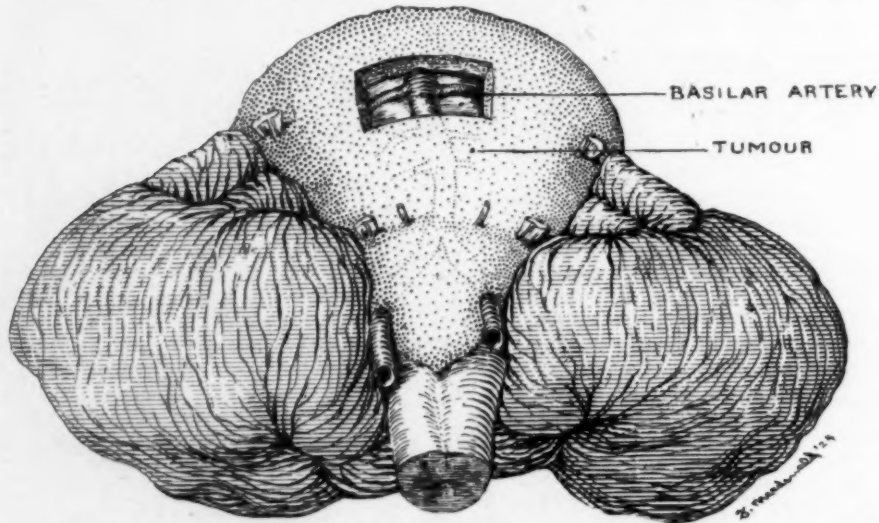


FIG. 3.—Drawing of an extensive tumor covering the ventral surface of the brain (Case II). In this case the basilar artery is entirely covered by the tumor and the vertebral arteries are seen entering at its lowermost parts. A window has been made in the tumor by Doctor Macdonald to show the basilar artery beneath.

of a rapidly developing paraplegia involving only the legs. Prior to his present illness he had apparently been well. He played normally with other children and offered no complaints. His mentality did not appear abnormal. He walked and talked at the usual age. One year previous to our examinations he first complained of a pain in the left leg above the knee and shortly afterward a backache developed in the lumbar region. A scoliosis and kyphosis appeared and increased. Soon a foot-drop developed, then the power of the left leg was affected. Nine months ago he began using crutches. The right leg then became paralyzed and for several weeks he had been bedfast. Control of urine was lost; several times it reappeared only to be lost again. The backache caused him great misery at night.

No complaints had ever been made referable to the head. The objective findings were those of a spinal cord lesion, presumably a tumor because of the gradual progression of signs and symptoms. There was incomplete *flaccid* paralysis of both legs but more marked on the left. However, there was some evidence of spasticity of certain muscle groups of the left leg—notably the hamstrings. A fairly definite bilateral sensory level could be made out at the first lumbar segment. The deep reflexes were normal on the right and absent on the left. A faint ankle clonus could be elicited at times on the left, not on the right. Plantar stimulation produced no response. The first and second lumbar spines were tender to pressure. The above signs and symptoms seemed to clearly indicate that the tumor occupied the lumbar enlargement and roots of the cauda equina.

INTRACRANIAL TUMORS AND HYDROCEPHALUS

Another objective but incidental finding in this case caused us much concern in the diagnosis. His head was very large. All the cranial sutures were widely separated (X-ray and Macewen's sign). The X-ray also showed an extraordinary degree of convolutional atrophy of the skull. The sella turcica was three times the normal size, though the posterior clinoid processes were still intact.

The eye-grounds were considered to be negative, though possibly the retinal veins were full but not tortuous. He had not now, nor had he ever complained of headache, dizziness or convulsions. There was no hemianopsia or other disturbance of vision. Our usual neurological examinations failed to find any additional signs by which an intracranial lesion could be located. That he had hydrocephalus could not be doubted,

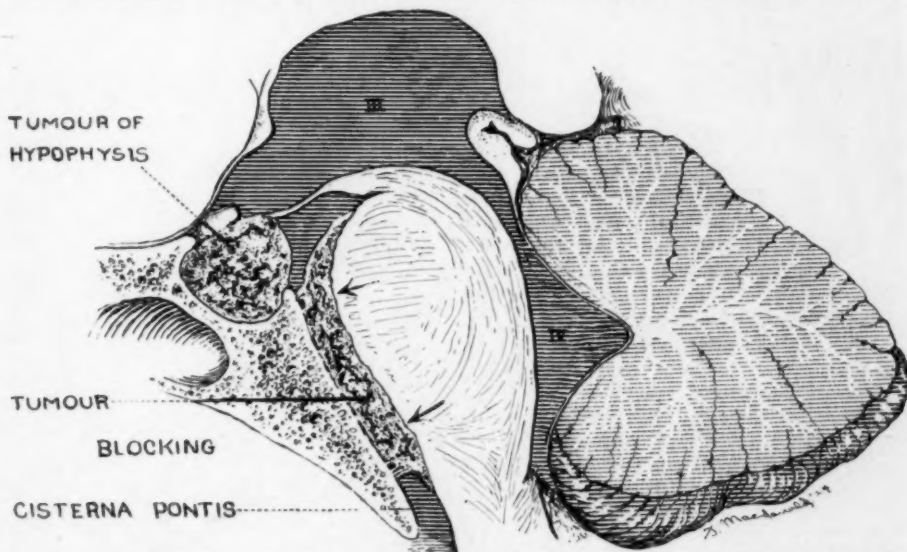


FIG. 4.—A mid-sagittal drawing in semi-diagrammatic form to show the extent and position of the tumor shown in Fig. 3. In both this case and the preceding one a spinal injection of India ink stopped at the lower margin of the tumor, for the cisterna was completely blocked. In this patient the tumor in the region of the hypophysis played no part in the production of the hydrocephalus.

and the deep convolutional markings of the inner table of the skull (röntgenographic findings) indicated that the hydrocephalus was not at a standstill.

Since the paraplegia could only be accounted for by a spinal cord tumor of some kind, it was necessary to assume the existence of a second tumor or other type of lesion to explain the hydrocephalus. Nor did it seem possible that the lesion which had enlarged the sella turcica could account for the hydrocephalus. In the first place, it was too far forward to obstruct the cisternal trunk, and in the second place, the normal vision made it appear that the tumor, if such it were, had broken through the dural envelope of the sella.

A spinal injection of air was made with the hope of obtaining more information concerning the spinal lesion. The spinal cord tumor was sharply localized by the level of air in the skiagram, but no air reached the cranial chamber.

Quite unexpectedly, however, additional proof of the existence of the intracranial lesion and something of its character, was disclosed. Below the level of the tumor the sheath of each spinal-nerve was distended into a distinct pouch about one centimetre in length. Such a finding indicated that the intraspinal pressure, which is but a transmitted intracranial pressure, must have been very high prior to the spinal block which had evidently only recently developed.

With proof that a spinal block existed, it was not clear that trepanation for ven-

WALTER E. DANDY

tricular puncture and phthalein test would throw additional light on the problem. After removal of the spinal cord tumor (a fibromyxoma) cerebrospinal fluid could be withdrawn in very large quantities from the spinal canal, showing that the hydrocephalus was surely of the communicating type. Probably the same occlusion should have been suspected from the dilated nerve sheaths which were demonstrable in the pneumogram. No attempt was made to treat the intracranial condition. The patient later came to necropsy. A diffuse glioma enveloped the entire exposed portion of the brain-stem. Strands of the tumor extended to the sella turcica and possibly joined by a strand another

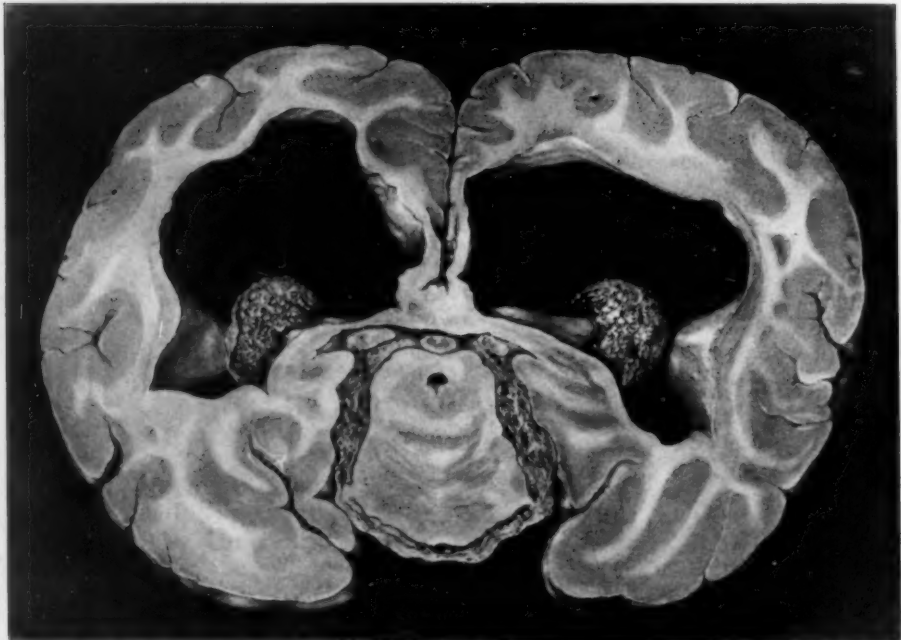


FIG. 5.—Drawing to show the circular extent of the tumor surrounding the mid-brain. Here the cisterna is entirely closed and the aqueduct is patent. Just as in the preceding case, a probe could be readily passed through the foramen of Magendie, the fourth ventricle and the iter.

tumor (the patient's third tumor) in the sella turcica. This sellar tumor seemed an entirely different growth and was attached to the sheath of one optic nerve; the pituitary body was intact and pushed downward and to one side of the sella.

India ink injected into the spinal canal passed through the foramen of Magendie, the fourth ventricle, the iter, third ventricle, and both lateral ventricles, but stopped abruptly at the lower margin of the tumor beneath the brain-stem.

CASE III.—An infant of six weeks was referred by Dr. J. L. Powe, of Hartsville, S. C., with an obvious diagnosis of hydrocephalus. Labor was difficult, instruments being used. The baby breathed only after heroic efforts had been applied. It was jaundiced during the first week and ran a fever throughout the first two weeks and during this time there was vomiting and great difficulty in feeding. For ten days the mother noticed that the baby's head would frequently jerk and draw far backwards. When three weeks old the head was unusually large. When one month old he had a crying spell in which the head was thrown back. Since then there have been many spells lasting a few minutes in which the body was in strong opisthotonos and he would cry out with pain. It has been impossible to gain weight, the little patient now being greatly emaciated. For a week it had not used either arm or leg normally.

The head was greatly enlarged, measuring 40.5 cm. in circumference. The anterior

INTRACRANIAL TUMORS AND HYDROCEPHALUS

fontanelle measured 15×16 cm. No reflexes were obtainable. Examination of the spinal fluid showed 100 cells per cubic millimetre—all polymorphonuclear cells—and a heavy globulin precipitate.

Phenolsulphonephthalein test (intraspinal injection): Free communication between both lateral ventricles and the spinal subarachnoid in fifteen minutes, the ventricular color (undiluted) corresponding with a standard 40 per cent. tube; 10 per cent. excretion in the urine in two and a third hours.

The diagnosis of an underlying inflammatory lesion seemed certain. Our presumptive diagnosis was hydrocephalus resulting from meningitis.

Necropsy: India ink was injected into the spinal canal. The pathological findings were entirely unexpected (Fig. 6). At the tip of each temporal lobe was a well-encapsulated abscess, which, while attached to the adjacent dura, could be removed, intact, with the brain. The abscesses, each the size of a golf ball, were of almost exactly the same size, 4×4 cm., and in precisely the same location. Unfortunately the organism could not be identified as the body had been embalmed with formalin before the brain was removed. Between the two abscesses was a dense broad band of subacute inflammatory tissue, and at the caudal end of this inflammatory band the ink injection had stopped abruptly. The foramen of Magendie and both foramina of Luschka were patent. All of the ventricular channels were unobstructed and greatly dilated. But little brain tissue remained in either hemisphere owing to the great ventricular distention.

From the history of jaundice, fever, and attacks of opisthotonos, all present almost immediately after birth, it seems probable that these abscesses were of intra-uterine origin. The inflammatory band and not the abscesses, *per se*, were responsible for the hydrocephalus.

In each of these three cases the cisterna pontis was completely blocked. In an earlier publication¹ adhesions in this region were found and suspected to be the etiological factor in the production of the hydrocephalus. Later, it was demonstrated by experiments on dogs² that when an impermeable band

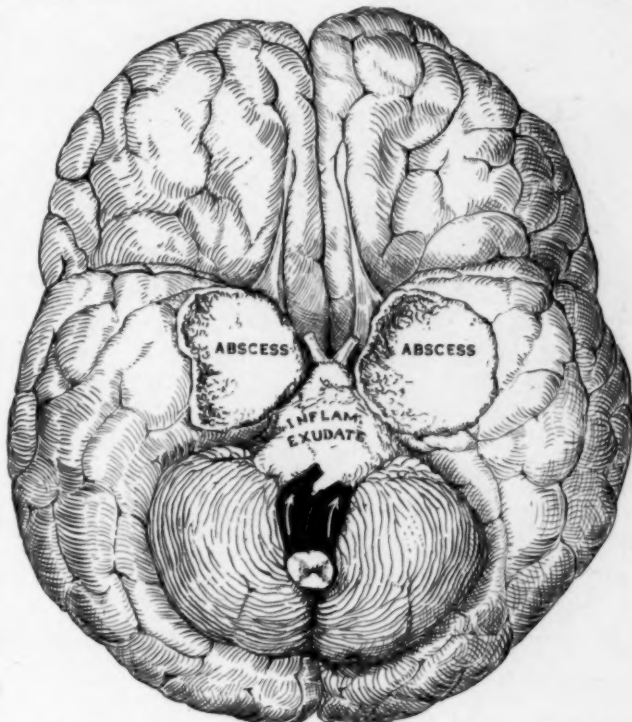


FIG. 6.—Sketch of the base of the brain in which an abscess was present at the tip of each temporal lobe. They were adherent to the underlying dura. Between the abscesses is a dense inflammatory mass entirely concealing the underlying vessels, and obliterating the cisternæ chiasmatis and interpeduncularis, as well as the cisterna under the pons, and mid-brain. The black covering over the medulla has resulted from an injection of ink into the spinal canal at necropsy, the ink stopping at the obstruction in the cisterna caused by the dense, subacute inflammatory mass.

of adhesions was constricted around the pons or mid-brain (occluding the cisterna), hydrocephalus of the communicating type followed. In these experiments and in human cases which have since come to autopsy,³ the line of obstruction has been graphically outlined by the sharp level at which India ink is arrested when injected intraspinaly. To understand why an obstruction in the cisterna pontis should cause hydrocephalus, it is only necessary to know the anatomy of the cerebrospinal spaces, the circulation of the cerebro-

Left and right foramen of Monro

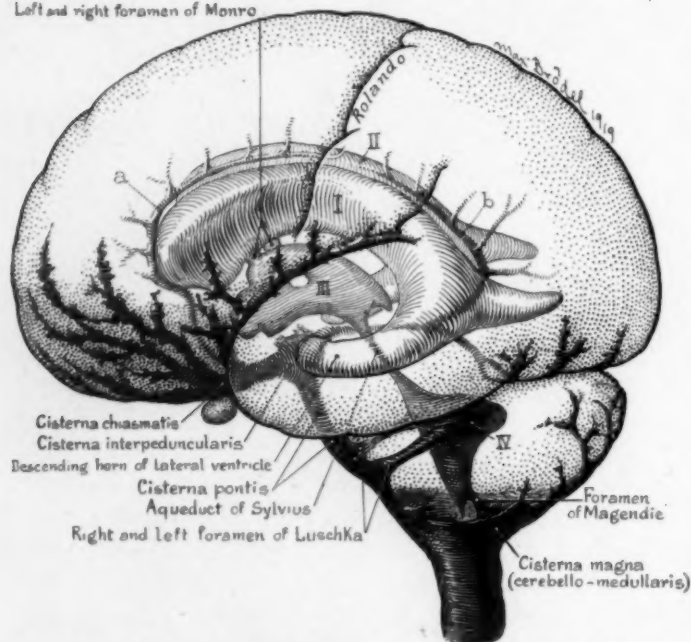


FIG. 7.—Diagram of the circulatory system for cerebrospinal fluid. The obstruction causing the hydrocephalus in each of the three preceding cases was in the subarachnoid space at the cisterna pontis. It is clear that fluid passing out of the ventricle can therefore not pass over the cerebral hemispheres where it is normally absorbed, and this reduction in the absorption of cerebrospinal fluid causes hydrocephalus of the communicating type—that type in which the ventricles communicate with the spinal canal.

spinal fluid, the place and manner of formation and absorption of cerebrospinal fluid. Briefly summarized, the necessary facts are as follows: Cerebrospinal fluid forms in the ventricular system (from the choroid plexuses) but does not absorb there. Cerebrospinal fluid absorbs in the subarachnoid space (directly into the capillaries in every part of the subarachnoid space,

and not into the dural sinuses or through special structures such as the Pacchionian granulations). The cisternæ beneath the brain-stem together serve as a conduit, which is the only communication between the cisterna magna (into which all the ventricular fluid is poured through the foramina of Luschka and Magendie). (Fig. 7.) A block in the cisterna pontis or another part of the conduit of cisternæ, whether by adhesions, an experimental band, tumors, or an inflammatory band, prevents the passage of fluid to the great absorbing area and causes the fluid to dam back to its source—hydrocephalus.

The long duration of hydrocephalus in Case II without symptoms makes us feel that the hydrocephalus was of slow development—possibly that the obstruction of the cisterna pontis was of gradual formation. When the transverse extent of the cisterna pontis is compared with that of the aqueduct of Sylvius, it is evident that a much longer time may be required for its

INTRACRANIAL TUMORS AND HYDROCEPHALUS

complete occlusion by a tumor's growth. Under such conditions the manifestations of hydrocephalus would surely be less fulminating. That partial closure of the cisterna pontis may be tolerated without causing hydrocephalus with communication, is demonstrated in cerebellopontile (acoustic) tumors. Often less than half of the transverse extent of the cisterna pontis remains when these tumors are found at operation or necropsy, but hydrocephalus does not result until the tumor has occluded the aqueduct of Sylvius. That the iter is obstructed from these tumors, can easily be demonstrated by injecting indigocarmin into a lateral ventricle at the beginning of the cerebellar operation; when the cisterna magna is exposed the fluid will be clear. Further proof that the obstruction is at the aqueduct and not in the cisterna pontis lies in the fact that pressure in the posterior cranial fossa can be relieved by tapping the lateral ventricle, whereas if the iter were patent and the cisterna pontis obstructed, all possible relief of pressure in the posterior fossa would be obtained by the release of fluid from the cisterna magna.

SUMMARY

Pathological evidence is offered to show that hydrocephalus of the communicating type may be caused by tumors and abscesses when so situated that they obstruct the cisternal conduit under the brain-stem. Post-mortem injections of India ink proved the cisterna pontis to be completely blocked in each case. The cause of hydrocephalus in these cases is precisely the same as in the more common instances resulting from adhesions after the spontaneous cure of meningitis. All cases of hydrocephalus, whether of the communicating or non-communicating type, have fundamentally the same underlying cause, an obstruction in the system of spaces through which cerebrospinal fluid circulates. The result of any such obstruction is a reduction of the spaces in which cerebrospinal fluid is absorbed.

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LENGTHENING THE SOFT PALATE IN CLEFT PALATE OPERATIONS*

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THERE is a distinct percentage of cleft palate cases in which, even though the operation succeeds in closing the cleft, fail from a physiological standpoint in correcting the speech of the individual. The reason for this failure to aid in phonation is the fact that the soft palate is unable to come in contact with the posterior pharyngeal wall.

An ideal cleft palate operation is one that will permit the patient to speak normally and at the same time close the defect in the palate. While both may be accomplished in a certain percentage of cases, we are all aware that there is a distinct type of case with a short palate in which the speaking voice has not been helped.

I have attempted in this proposed operation of mine to first obtain a sufficient length of palate to insure good phonation and later on attempt to close the hard palate.



FIG. 1.—Modified from Brophy's book.
Incision to release the hard palate.

I advise this type of operation on all cases where a short soft palate will result from any operations hitherto described, for example, the Langenbeck. Despite the fact that most operators prefer doing their operations before the second year, in my opinion, the best time to operate where we wish to lengthen the soft palate is from the fourth year on. I find that from the fourth year on the structures of the hard and soft palate contain more fat and lymphoid tissue and will stand manipulation much better than in the younger child.

My anatomical studies, both on the normal and the cleft palate, have made it quite clear to me that if the increased length is to be accomplished, it must be obtained by releasing the anterior attachment of both the hard and the soft palate. To release the structures of the hard palate, I make an incision as shown in Fig. 1, at the same time freshening the edges of the cleft. I then raise the flaps as shown in Fig. 2. These flaps contain all the structures down to and including the periosteum over the hard palate. The elevation of this flap is continued until the border of the hard palate is reached as shown in Fig. 3, the attachment of the palatine aponeurosis of the hard palate is divided. On reaching the tuberosity of the maxillary bone it will

* Read before the Philadelphia Academy of Surgery, April 6, 1925.

LENGTHENING THE SOFT PALATE

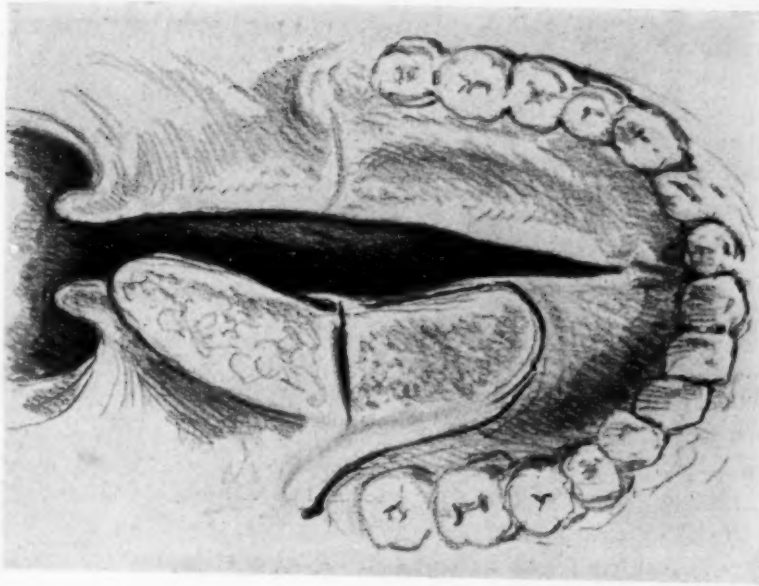


FIG. 2.—Palatal flap raised.

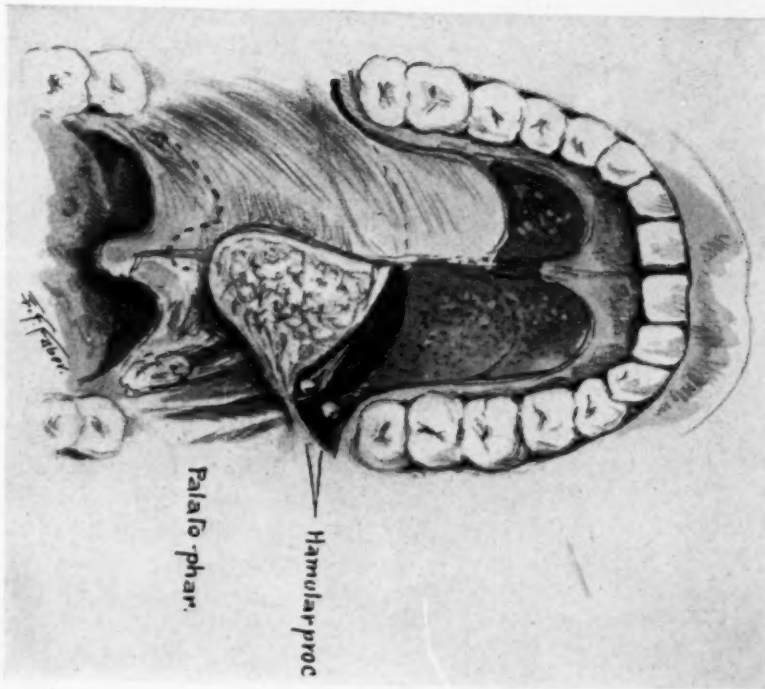


FIG. 3.—Hard palate completely exposed.

be found that there is still some structure which prevents the palate from falling backwards. This structure is the tendon of the tensor palati muscle. If the hamular process around which this muscle turns at a right angle is broken off the divided portions will be drawn downward by the pterygo-pharyngeus muscle—this muscle being a much stronger and larger structure than is usually described. After this hamular process has been fractured you dislocate the tendon of the tensor palati muscle, thus changing its direction so that instead of forming two sides of a right angle triangle it will form the hypotenuse and as shown in Fig. 4, and will allow the lengthening of this muscle and transpose it from a tensor into a levator muscle. This can be demonstrated on any cadaver. After the above procedure has been performed on both sides, you will gain one-half to three-quarters of an inch lengthening and there will be found to be less tension than under the Langenbeck operation. The two flaps will be sutured together, as shown in Fig. 5, using whatever suture you especially desire. The anterior edge of these flaps will have a tendency to fall downward. To hold them in place, suture them to

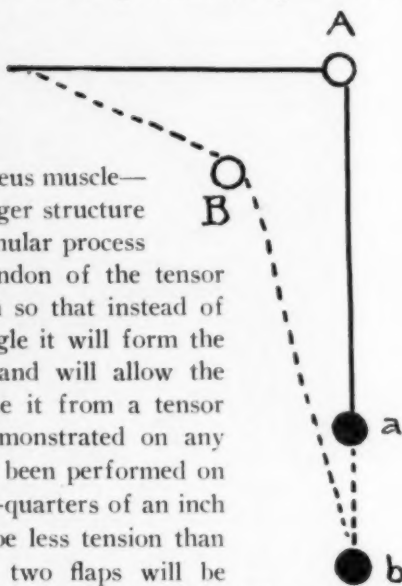


FIG. 4.—Alteration in direction of tensor palati muscle.

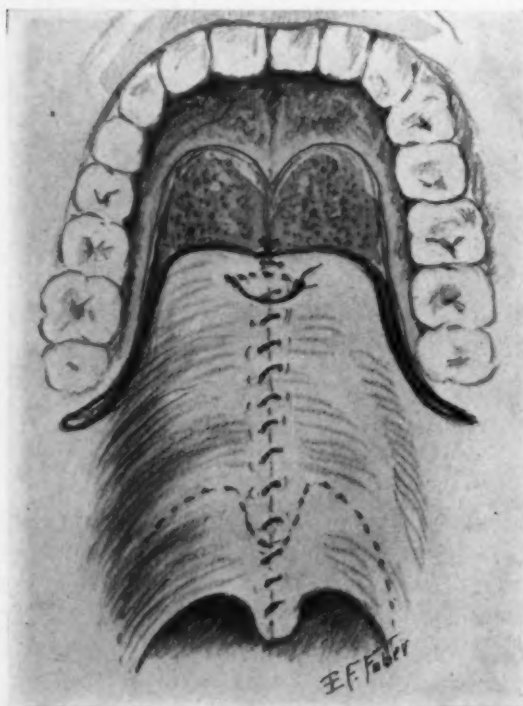


FIG. 5.—Note increased length of palate below dotted line.

either the remains of the septum or the horizontal plate of the palate bone. While this operation gives you the desired lengthening as shown in Fig. 5, it leaves a defect in the anterior portion of the hard palate. This is later closed by means of a flap.

In one case the palate was so short that my colleague, Dr. LeRoy Johnson, Professor of Orthodontia at the University of Pennsylvania, felt that no operation was justifiable. As he expressed it, "You will only have a stiff palate which will not close off the opening." Nevertheless, after the operation in this case one will see that the palate comes in contact with the posterior pharyngeal wall, shutting off the mouth

LENGTHENING THE SOFT PALATE

from the nose. There is a point I have been asked about a number of times. Does not this method predispose to sloughing of the flaps? In the cases I have observed so far, I have noted less blanching of the flaps than in my usual cleft palate operations. There has been no sloughing. The blood supply comes in through the tonsillar plexus. It has always been my contention that in a correctly performed Langenbeck operation the posterior arteries are divided.

I thank Dr. Addinell Hewson for the many courtesies he has extended and the help he has given me in the Anatomical Laboratories of the Post-graduate Department of the University of Pennsylvania.

EPIGASTRIC PAIN A SYMPTOM OF OESOPHAGEAL OBSTRUCTION*

By PORTER P. VINSON, M.D.

OF ROCHESTER, MINN.

FROM THE SECTION ON MEDICINE, OF THE MAYO CLINIC

IN THE differential diagnosis of pathologic processes producing epigastric pain, disease in the oesophagus is usually overlooked; and yet pain in the upper abdomen as a symptom of oesophageal obstruction, particularly cardiospasm, occurs sufficiently often to warrant the consideration of every careful surgeon.

Pain may occur in the epigastrium during the course of an oesophageal cancer involving the cardia, but considerable dysphagia is usually present before the onset of the pain. In cases of oesophageal carcinoma, regardless of the location of the lesion, pain rarely occurs early, and errors in diagnosis are therefore infrequent. In a small number of cases pain may be the first symptom. In a few such cases that have come under my observation a previous diagnosis of disease in the gall-bladder had been made and the patients had been subjected to an abdominal exploration. However, errors in diagnosis in this group are not nearly so frequent as in cases of cardiospasm.

Upper abdominal pain, usually located high in the epigastrium, occurs in about three-fourths of the cases of cardiospasm, and it may be of such severity that it simulates very closely the pain of gall-stone colic or that of angina pectoris. The initial symptom of cardiospasm may be a severe pain in the epigastrium with radiation to the back, to the throat, or into the ears. It may arise independently of deglutition, and the patient frequently requires a hypodermic of morphin for relief. Such severe attacks may come at frequent intervals, for months or even years before there is any suggestion of an obstruction in the oesophagus to the passage of food. One of my patients had had severe attacks of this type for fourteen years before the onset of dysphagia. Before the dysphagia begins, the Röntgen-ray examination rarely reveals any obstruction at the cardia; and unless a thick acacia mixture is used as a vehicle for the barium, the obstruction may not even be noted later in the disease.

The occurrence of mild dysphagia during the course of disease in the gall-bladder, because of a secondary spasm at the cardia, adds to the difficulty of differentiation. The greater frequency of the attacks without jaundice and without residual tenderness in the region of the gall-bladder and the presence of slight dysphagia are the chief points in the differentiation of cardiospasm from acute cholecystitis. In certain cases, a definite differential diagnosis is impossible in the early stages.

The differentiation of the pain of cardiospasm from that of angina pectoris

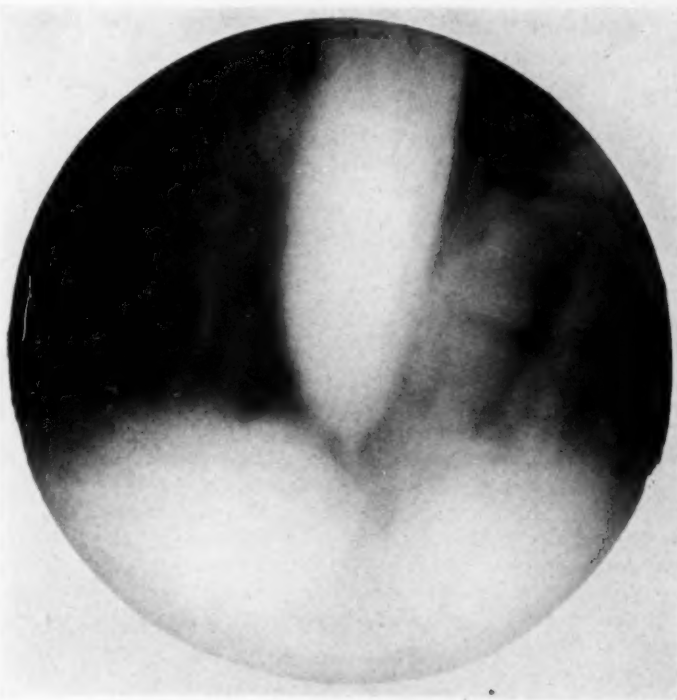
* Submitted for publication April 17, 1925.

EPIGASTRIC PAIN IN ŒSOPHAGEAL OBSTRUCTION

can usually be made without difficulty, if the heart is thoroughly investigated. One of the patients suffering from cardiospasm also had angina pectoris and gall-stone colic, but the findings relative to each condition were so characteristic that they could be easily recognized as independent entities.

The two cases herewith presented illustrate how the pain of cardiospasm may be confused with that of disease in the gall-bladder.

CASE I.—A woman, aged fifty-three, came to the Clinic, May 6, 1919, complaining of having had attacks of epigastric pain for four years. The pain would begin in the pit of the stomach and usually radiate toward the right side and to the back between the shoulders. Vomiting had accompanied two of the attacks. The attacks were not accompanied by jaundice. There had been intervals of from two to four months between the seizures. There was also a sensation in the lower œsophagus as of food not passing readily into the stomach, and the patient attributed some of the attacks to the bolting of her food.



An ordinary Röntgen-ray examination of the stomach failed to reveal any evidence of disease, and a test-meal was withdrawn from the stomach without evidence of obstruction to the passage of the stomach tube. The general examination of the patient was negative save for slight tenderness over the region of the gall-bladder, an apparent enlargement of the liver and small adenomas of the thyroid, without hyperthyroidism.

Very little consideration was given to the history of dysphagia and a diagnosis was made of chronic cholecystitis. Operation revealed a rather thick-walled gall-bladder without stones, and there was definite enlargement of the liver with considerable chronic hepatitis.

The patient was fairly comfortable for eight or nine months after the operation, but when she returned for reconsideration, November 17, 1920, the symptoms were about as severe as at the previous visit. Because of her inability to remain for complete study, a thorough examination could not be made.

On account of the increasing severity of the attacks and the necessity for using hypodermic injections of morphin for their relief, the patient returned for reëxamination

PORTER P. VINSON

February 6, 1925, and at this time another ordinary Röntgen-ray examination of the stomach failed to show any evidence of disease. There was again no obstruction at the cardia to the passage of a stomach tube. At this time there was no relation of the pain to the ingestion of food, but there was still a definite sensation in the œsophagus that food did not pass into the stomach without considerable hesitation.

A special Röntgen-ray examination of the œsophagus revealed an obstruction of the barium meal at the cardia, which was probably the result of spasm. The patient was advised to have the cardia stretched with a hydrostatic dilator, but she declined to remain for treatment.

It is interesting to note that the pain from cardiospasm, as well as dysphagia, is relieved by a thorough stretching of the cardia. The act of dilating often reproduces the type of pain experienced during the course of the disease.

CASE II.—A man, aged forty-three, came to the Clinic, April 10, 1922, stating that he was perfectly well save for heart-burn at times and an occasional stomach-ache. This had continued from the age of twenty or thirty years until October, 1921, when he was awakened about midnight by a severe epigastric pain which lasted off and on for two and one-half hours; it would last from ten to fifteen minutes and be followed by a free interval of about the same length of time. A diagnosis of gall-stones was made, and because of an idiosyncrasy to morphin, it was necessary to administer chloroform. After this time the patient was well until February, 1922, when there was a second and even more severe attack. There was no jaundice following either attack. After such seizures a feeling of fulness remained in the stomach, and at times there was very slight difficulty in swallowing liquids. A Röntgen-ray examination of the stomach was made with negative results, but the patient said it was difficult for him to swallow the barium mixture. A diagnosis of chronic cholecystitis with cholelithiasis seemed warranted, and operation revealed a gall-bladder filled with small stones.

About two weeks after the operation, the patient had a third attack of pain and dysphagia became more and more noticeable, more marked with swallowing liquids than solid food. Mild epigastric pain occurred often. A Röntgen-ray examination made at the patient's home revealed a definite cardiospasm with moderate dilatation of the œsophagus and he returned to the Clinic for treatment February 16 of this year. (Fig. 1.)

On stretching the cardia with a hydrostatic dilator, the previous type of pain experienced was reproduced but was not severe enough to necessitate an anæsthetic. Dysphagia was completely relieved by the stretching, and the patient returned home after seven days' observation.

It is, of course, difficult to determine that the first two attacks of pain were not due to gall-stones, but subsequent events possibly warrant the conclusion that the cardiospasm had been responsible for all of the patient's symptoms and that the disease in the gall-bladder was incidental.

IMPROVED GOITRE TECHNIC

By JOSEPH L. DECOURCY, M.D.

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THE following discussion is based upon 1432 thyroidectomies performed during the past five years by myself and associates at the DeCourcy Clinic, and is intended primarily as a technical contribution. While pre-operative judgment is important in goitre surgery (whether to ligate, whether to do double ligation, whether to remove one or both lobes, whether to leave wound

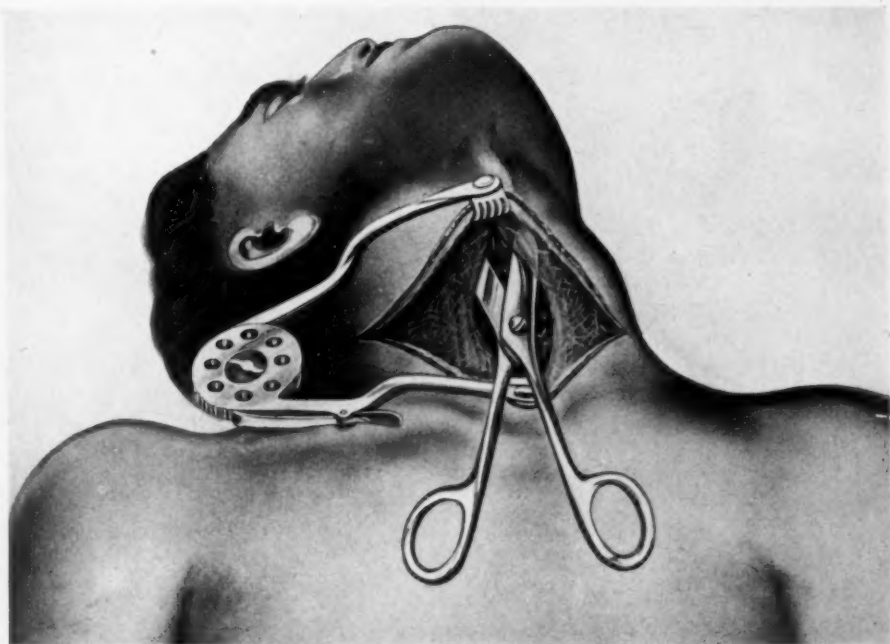


FIG. 1.—After median incision is carried through muscles and fascia down to gland, scissors are inserted and spread apart, thus separating the thyroid gland from the overlying structures.

open) and has reduced the operative mortality to nil in trained hands, still this judgment will be of no value unless the operation be performed skilfully and with dispatch.

There is no operation which lends itself more beautifully to technical grace than does thyroidectomy. Types of goitre vary and may cause slight variations in technic, but the underlying principles are the same in all cases.

The incision which we use is placed in the lower crease of the neck. This crease is readily seen in almost every neck and invites the incision. It is preferable to lower incisions because of the looseness of the neck which causes the edges to fall together.

The muscles are separated by a median line incision through the fascia.

After the incision is carried down to the gland, it is enlarged upward and downward from the thyroid cartilage to the sternum. To facilitate this, scissors are inserted through the incision and separated, thereby freeing the gland from the overlying structures.

The finger is then swept over both lobes, thereby loosening any small adhesions and either lobe is then elevated. It is frequently possible to raise the gland by traction with a tissue forceps or hæmostat, but at times the gland



FIG. 2.—Anatomical capsule is wiped from gland with gauze dissection, thus carrying important structures away from operative area.

is so friable that this is unwise, and if proper care is used in raising the gland with the finger, no harm will be done.

After the gland is raised it is grasped with a lobe forceps and the anatomical capsule is wiped from the gland with gauze dissection, thereby giving a surgical field with all the important structures removed.

A double strand of catgut is then carried around the upper pole and tied, thus controlling the superior artery. Hæmostats are then placed along the side of the gland, inserting them so that they grasp quite a bit of tissue. Three to five are usually sufficient. With sharp dissection the gland is then incised in the proper plane, the idea being to leave gland sufficient to lie on a level with the denuded trachea. If any bleeding points appear while this dissection is being done, they are grasped. After the dissection is carried to the trachea the opposite side is dealt with in similar manner. Slight traction is made while dissecting the second side and as the trachea is reached a line of cleavage usually appears and the isthmus is readily stripped across. Sufficient

IMPROVED GOITRE TECHNIC

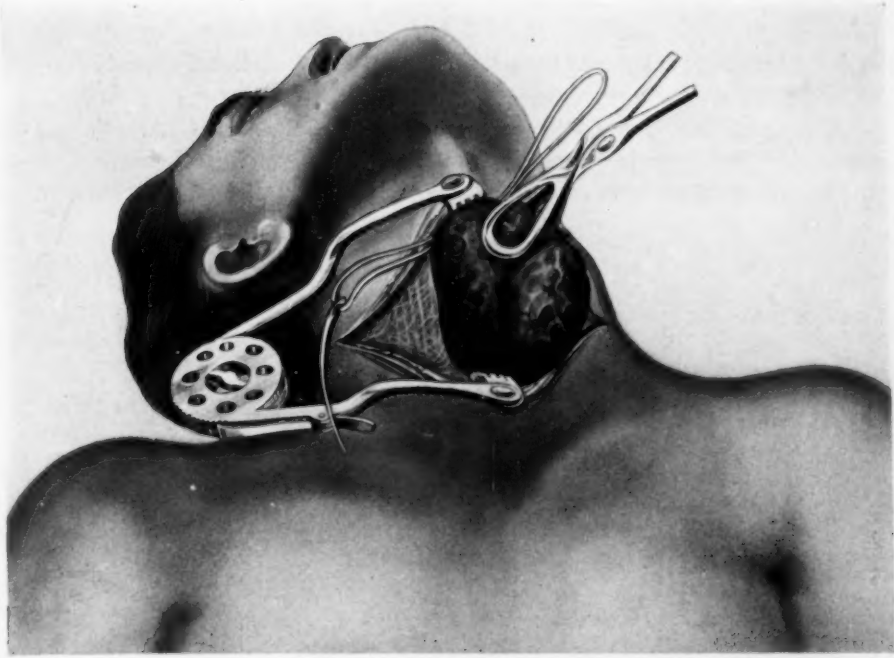


FIG. 3.—Double No. 3 chromic catgut passed around upper pole and tied.



FIG. 4.—Placing of clamps on inferior and anastomosing vessels prior to resection.

tissue usually remains under this line of cleavage to properly protect the trachea.

The hæmostats are next tied off, using No. 2 chromic, and the field inspected closely for any oozing.

A strip of narrow packing gauze, saturated with Albolin (Albolin gauze) is laid over the denuded area and the wound closed. The gauze is brought out the centre of the skin wound and is removed in twenty-four hours. This

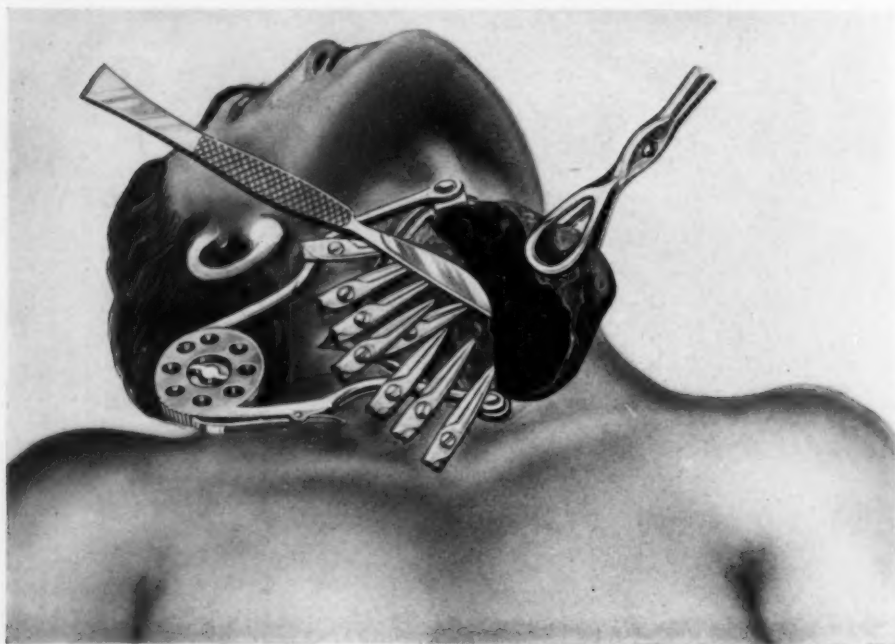


FIG. 5.—Sharp resection of gland—practical in over nine of every ten cases.

serves two purposes; controlling oozing which may occur in spite of all precautions, and leaves a small slit through which serum may be removed later. It has been our experience that serum collects in these wounds, even when no drainage has been used and continues to collect for about ten days following operation.

In dealing with encapsulated adenomata, I presented a technic in *ANNALS OF SURGERY* about one year ago (January, 1924), which we still use in all such cases.

Occasionally in exophthalmic cases where the gland is very brittle, it is advisable to cut the sternohyoid and sternothyroid muscles. This may also be true in very large adenomata, but we have found that with a sufficiently long incision separating the muscles, that this procedure is becoming more and more unnecessary.

We still believe that surgery is indicated in toxic colloids; colloids which resist medical treatment; all adenomata; and all exophthalmic cases. Because in our experience:

IMPROVED GOITRE TECHNIC

Toxic colloid goitres are frequently made more toxic by thyroid and iodine therapy.

Simple colloid goitres which resist treatment, frequently become toxic under prolonged therapy.

Four out of every five adenomata become toxic at some stage.

One out of every seventy cases of adenomata will become cancerous.

One out of every two hundred cases of adenomata will strangle to death.

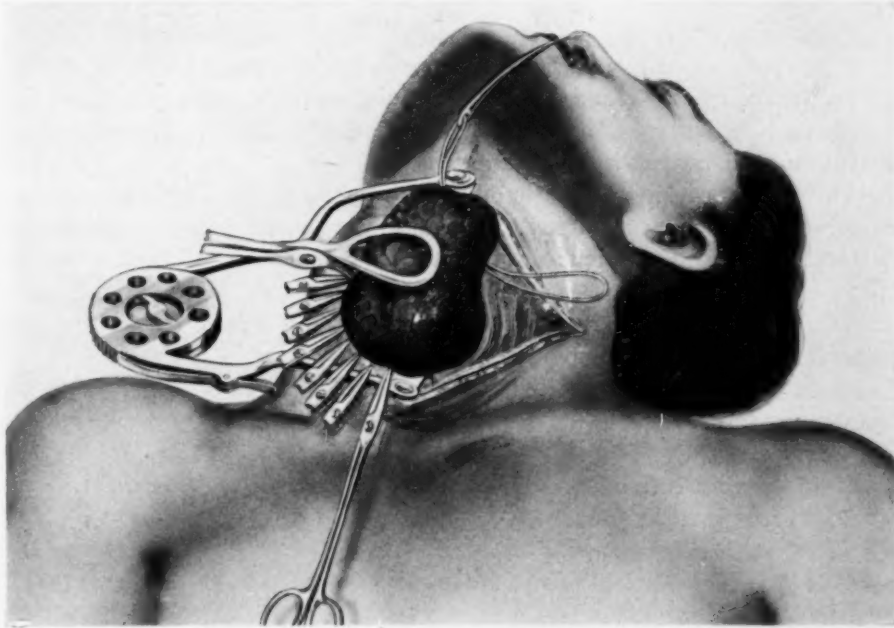


FIG. 6.—Opposite lobe ready for similar resection. Whole gland to be removed *in situ*.

Myocardial degeneration of the heart will gradually supervene in all toxic cases.

Irreparable damage to the heart will supervene in nine out of every ten exophthalmic cases treated medically as transitory cases.

Complete thyroid cures are of little value if a permanently damaged heart remains. Early operations result in 100 per cent. cures in adenomata; 98 per cent. cures in toxic colloid removals and 90 per cent. cures in exophthalmic cases provided that proper after-treatment is insisted upon. Normal function and return to normal working capacity will be much quicker and more permanent following surgery than following medical treatment. The mortality in all cases is less than one per cent.

HERNIA OF THE LUNG

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AND

HARRY LUTZ, M.D.

OF AUGUSTA, KANSAS

A PROTRUSION of any part of one or both lungs through their boundaries, chiefly the thoracic wall, and usually in a sac of parietal pleura under the skin, is called a lung hernia. The expression "under the skin" is used to obviate confusion with traumatic evisceration.

The history of lung hernia is difficult to obtain as the literature contains numerous errors and contradictions. The first case was described by Roland in 1499. Later observations were made by Hildanus in 1606, Loyseau in 1617, and Plater in 1641. According to the above definition, the case described by Felix Plater is probably the first true lung hernia and the earlier cases merely traumatic eviscerations.

In an extensive review of the literature we have been able to find fifteen cases reported previous to 1800 and probably only nine of these were true lung hernias.

The following is the Morel-Lavellée classification of lung hernia:

1. According to location.
 - a. Diaphragmatic.
 - b. Thoracic.
 - c. Cervical.
2. According to etiology.
 - a. Congenital.
 - b. Acquired.
 1. Traumatic.
 2. Consecutive.
 3. Spontaneous.
 4. Pathological.

Strübing, Desfosses, Urbach and others offer two objections to this classification, first, regarding the exact meaning or definition of congenital lung hernia, and second, the use of the word "consecutive" in acquired hernias.

Diaphragmatic Hernia.—Only one case of diaphragmatic pneumocele is recorded in the literature. Beal's description of this case is that of a right subphrenic abscess. It followed an injury in which the lung herniated through the diaphragm and the intestine was perforated. The lung tissue was pathologically amputated and secondarily infected by the peritonitis from which the patient died. The findings were confirmed by autopsy and microscopic examination of the tissue.

HERNIA OF THE LUNG

Congenital Pneumocoele.—Hochsinger says all hernias resulting in the first few weeks after birth must be considered congenital. If we regard Hochsinger's cases as acquired, the congenital lung hernias are only found in foetal monstrosities not compatible with life.

Cruveilheir describes the only case of congenital lung hernia found in the literature. He delivered a foetal monster with an encephalocele over the occiput and an anterior spina bifida in the cervico-dorsal region. The right lung extended up in the neck to the superior border of the larynx.

Acquired Hernias.—The great majority of acquired lung hernias are traumatic. Those that occur early after injury have been classified by Morel-Lavallée as traumatic, and, late after injury, as consecutive. The word "consecutive" may be omitted from the classification, as it signifies only a difference in the time of appearance of a traumatic hernia after injury.

Spontaneous Pneumocoeles.—In spontaneous lung hernias there is a rupture through a locus minoris resistentiae due to extreme changes in intrathoracic pressure. Wightman reports the occurrence of a spontaneous pneumocoele in a flute blower. Boerhaave reports a pneumocoele occurring in a primipara during labor; and Massoti reports a lung hernia occurring in a brewery worker while lifting.

Pathological Pneumocoeles.—Pathological lung hernias result from diseases of the thoracic boundaries as carious ribs, empyema necessitatis, perforating lung abscesses, malignant growths, etc.

Etiology.—In an analysis of 165 cases found in the literature, the figures vary a great deal on account of incomplete data.

Age.—In 61 cases: 21 were under 15 years, 19 were from 15 to 45 years, 21 were over 45 years.

Sex.—In 58 cases: 13 were females, 45 were males. A ratio of over 3 to 1, and this is undoubtedly too low, because at least 50 per cent. pneumocoeles are traumatic. In Debiegne's cases only 3 out of 41 were females.

Occurrence.—In 165 cases: 29 were congenital or early acquired, 83 were traumatic, 53 were spontaneous. They occur single, multiple, unilateral and bilateral.

Location.—In 78 cases: 10 were in right supraclavicular region, 6 were in left supraclavicular region, 34 were on the right anterior chest wall, 23 were on the left anterior chest wall, 2 were on the right posterior chest wall, 3 were on the left posterior chest wall.

Anatomical Consideration.—The greatest majority of lung hernias occur on the anterior chest wall, near the sternum. Anatomically there is probably a definite reason why they should occur at this point. Anteriorly, from the costo-cartilaginous junction to the sternum, the external intercostal muscle is absent. Posteriorly, from the costal angle to the vertebra, the internal intercostal muscle is absent. Anteriorly this area is protected by the pectoralis major muscle, but it does not afford the restraint supplied the costo-vertebral angle by the heavy longitudinal muscles, trapezius, latissimus, dorsi and rhomboidei.

The early workers, Morel-Lavallée, Cloquet, Richerand, Bernard,

Hochsinger and others, wrote a great deal on the mechanics of the production of a pneumocele.

In view of our present-day knowledge of the changes that are possible in intrathoracic pressure as taught us by such physiologists as Donders, Heynsius, Hutchinson, Herman and Howell, together with the added infor-

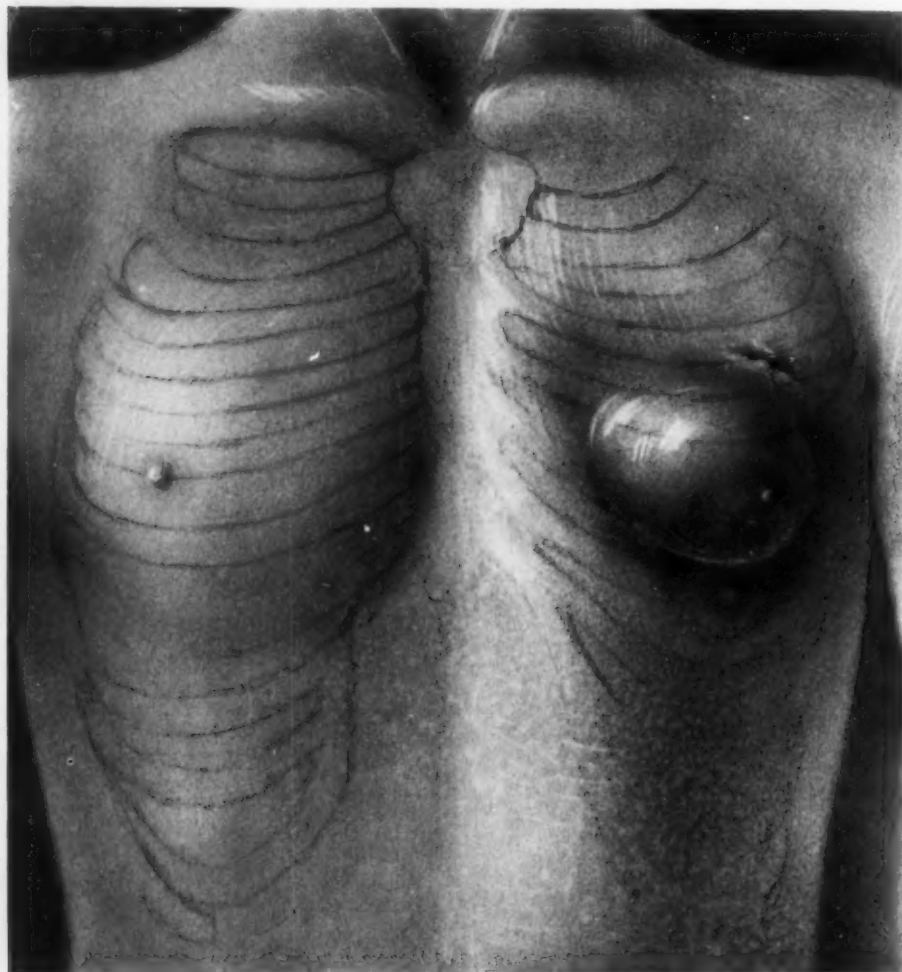


FIG. 1.—Shows the approximate size and location of the lung hernia and scar.

mation given us by the U. S. Empyema Commission during the World War on inter- and intra-thoracic pressure relations, we know that lung hernias result from a locus minoris resistentiæ of the thoracic wall and intrathoracic pressure changes. These changes are caused by forcible expiration with varying degrees of closure of the glottis and voluntary contraction of tensing of the muscles of the chest wall, abdomen and diaphragm. According to Sir Arthur Keith in his William Mitchell Banks Memorial Lecture, given at the University of Liverpool, November 1, 1923, on "The Origin and Nature of Hernia,"

HERNIA OF THE LUNG

he states that, "almost all, if not all, hernias in adults are caused by the repetition of strain day by day," and this is applicable to pneumocele. Keith, however, does not mention lung hernia.

Etiology of Pneumocele.—Congenital pneumocele follows defects that occur in the ribs and sternum which are covered by fibrous bands and are located chiefly along the sternum. They are due to: amniotic bands, pressure of the elbow of the foetus against the chest wall, lack of liquor amnii, pressure of uterine fibroids, reversal of the foetal head, etc. Bronchiectasia foetalis is given as a cause.

Spontaneous lung hernias are due to: Chronic bronchitis; whooping cough; congenital absence of muscles, breasts, etc.; absence of intercostal muscles; blowers of glass and musical instruments; tight lacing, straining at stool, lifting and labor, especially in a primipara (Boerhaave); defects in cervical fascia and diastasis of the muscles, especially the scalenii (Graham).

Traumatic hernias follow: Falls from a height, injuring chest (Roche-Despres); stab wounds injuring the intercostal muscles, fascia or nerves (Larrey-Velpeau); non-union of fractured ribs (Hugier-Litten); war wounds, shrapnel and bullets (Hertzberg); crushing wounds (Vogler-Kohler); plastic chest operations of Estlander, Schede and thoracotomy, particularly without an aperiosteal rib resection.

Pathological pneumoceles follow: Breast and lung abscesses (Bruns); empyema necessitatis; caries of ribs, etc.; abscess chest wall (Belany).

Symptoms.—The symptomatology of pneumocele varies a little according to the classification. Pain and distress is always present and located in the region of a palpable thoracic rent or orifice, through which a pulsion lung mass projects and reduces spontaneously upon slightly increased expiratory effort.

The onset is usually insidious, accompanied by local pain and cough. The cough is chronic, spasmodic and non-productive.

The congenital types of pneumocele are first recognized by the family or physician. The acute traumatic hernias are usually obscured by the more severe symptoms of injury to the viscera, pleura or chest wall.

The latent, traumatic hernias, or the consecutive types, are characterized by an insidious onset, pain in the region of the hernia, a pulsion mass, and usually, a chronic cough, which ejects the lung at intervals, making the patient twinge with pain as if he had a pleurisy.

There are no more systemic symptoms than those which are characterized by inguinal hernia.

Local inflammatory conditions, either acute or chronic, may be a sequence of the incarcerated, non-reducible types of pneumocele. This is, however, an unusual type.

Physical Findings. Inspection.—The physical findings also may vary somewhat with the type of hernia. Upon inspection a mass is visible upon the thoracic wall, which come through an orifice under the skin and reduces itself spontaneously and synchronously with respiratory effort. The size and contours

of the orifice is suggested by the vibratory movement of the skin in this region. The protruding mass is usually ovoid. There may be a local scar, bony irregularity, cutaneous vascular change or signs of inflammation.

Palpation.—The hernial orifice is usually very easy to palpate, but Wiederhofer's case, in which the hernia followed the intercostal vessels, would be an exception. The orifice is either bony or fibromuscular. It is most often possible to insert the tips of one or more fingers into the orifice and by pressure maintain reduction of the mass. When the hernia protrudes, it is possible to grasp the lung and hold its border during respiratory excursion. One can feel the lungs soft, spongy, crepitant consistency.

Percussion.—The percussion note is tympanitic, with probable variation between the tympany of the chest and abdomen (Debienne).

Auscultation.—Auscultation depends on the pathology present. In the late traumatic type there are few sounds except, when herniation is present. At this time, if the lung is grasped in the sac and held, vesicular whistling and crackling râles are heard.

Diagnosis.—The diagnosis of pneumocele is perfectly evident because there is usually a history of injury, scar or deformity of the chest wall, a palpable orifice, through which a smooth, soft, crepitant, reducible tumor appears under the skin; and still more conclusive, one may grasp the lung edge while in the sac, feel its consistency and the tug during respiratory excursion.

Differential Diagnosis.—The differential diagnosis should be made from: reducible liquid or gaseous tumors sometimes found protruding through the intercostal spaces in malignancy of the lung, excessive effusions as empyema necessitatis, cold abscess, soft lipomas, angiomas and localized emphysema.

Prognosis.—Pneumocèles rarely cure themselves spontaneously. Strangulation is not common. (In Wightman's case the pneumocele strangulated followed by pathological amputation with no serious effect.) Lung hernias *per se* rarely cause death. If radical cure cannot be accomplished, it is necessary to modify the patient's occupation and treat the tumor conservatively.

Treatment.—The treatment is either medical or surgical and depends on the type of hernia, also the existing local and intrathoracic pathology. Fox reports the cure of a case by bandage. Grant reports a recurrence after an apparent cure by bandage. Bandage in Frickhöffer's case caused dyspnoea and cyanosis. Obturators maintained by bandage were made to occlude the hernial orifice. The removal of the underlying pathology will cure certain types as from chronic bronchitis, etc. Where the etiology of pneumocele is occupational, as blowers of glass and wind instruments, heavy lifting, etc., it is necessary to change the type of work. In the conservative treatment elastic bands, plates that cover the hernial orifice, especially made corsets and obturators of various types are used. Most of the early writers spoke disparagingly of any attempt at a radical surgical cure. Vogler, in 1898, suggests

HERNIA OF THE LUNG

performing a plastic operation, using periosteum or a bone flap from the sternum. Vulpius, in 1898, described a plastic operation performed by crossing strips of rib and suturing with silver wire. This hernia recurred in a year. Graham packed the sac of a cervical pneumocele with iodoform gauze, creating an inflammatory reaction which was followed by cure. Tuffier freed and ligated a hernial sac with cure. Reynier made an immediate closure of a traumatic pneumocele with cure.

To the less than two hundred cases of lung hernia in the literature we

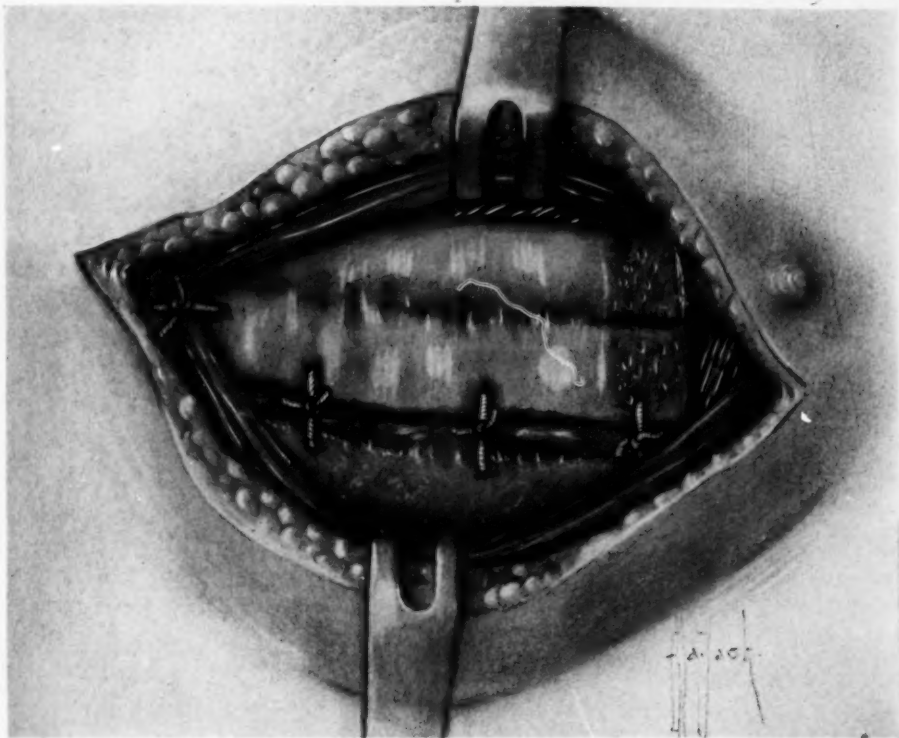


FIG. 2.—Shows the osteo-cartilagenous flap obliterating the fourth interspace and hernial orifice.

wish to add one case of traumatic pneumocele of the left anterior chest wall cured by an osteoplastic operation.

CASE, No. 4698, male, laundry worker, entered the Kansas City General Hospital, January 16, 1924. His chief complaint was a painful lump in the left precordial region, with a paroxysmal and non-productive cough. In February, 1923, he was stabbed in the left anterior chest wall above the base of the heart. No medical attention was rendered and recovery seemed complete until December, 1923, when he developed a cough, and simultaneously with the onset of a persistent, spasmodic, non-productive cough, he began to have pain in the left mammary region, where an intermittent pulsion lump was beginning to form. This lump disappears between paroxysms of coughing, during which time he has no pain. Examination revealed a fairly well-nourished and developed white male, active, erect, ambulatory, five feet six inches tall, weighing 160 pounds, sixty years of age, and having the appearance of a man of fifty years. His general physical examination is negative.

His chest measures 39 inches, is flat anteriorly and full posteriorly due to an upper, senile, dorsal kyphosis. The supraclavicular fossæ are well filled. The respiratory costal excursion is rather limited but equal. On the left anterior chest wall, 2 inches above the nipple and 4 inches from the midsternal line is a scar 1 inch in length and directed transversely. This scar is the result of a stab wound sustained February 15, 1923. The respiratory rate is 21, abdomino-thoracic type, involuntary and normal. Upon deep inspiration a small vibratory depression is perceptible between the fourth and fifth ribs to the left of the sternum. Upon forced expiration, as from coughing, a tumor presents itself through the depressed area.

Palpation reveals a longitudinal opening in the left fourth interspace that is about 2 inches long and $\frac{1}{2}$ inch wide, extending from the lateral sternal margin to the costochondral junction. Inserting the tips of the fingers of one hand in this orifice prevents the protrusion of the spontaneously reducible mass, even during violent coughing. It is also possible during coughing to grasp and hold the tumor and thus prevent it from reducing. It is uniformly round, soft, crepitant, tugs with respiratory excursion and measures $3\frac{1}{2}$ inches in diameter. Percussion over the mass is tympanitic. Auscultation over the mass, while holding it in the sac, emits crepitant, vesicular and whistling râles.

Laboratory findings of the blood, urine and Wassermann were negative. X-ray examination by Dr. L. A. Marty showed a little widening of the left anterior fourth interspace and no evidence of pulmonary disease. Dr. L. A. Marty reports a herniation of the lung in the precordial region from fluoroscopic examination.

The diagnosis of pneumocele is made in this case because: first, the history of injury; second, a scar and a palpable hernial orifice; and third, the presence of an intermittent, pulsion, cutaneous mass that contains lung tissue, the presence of which is supported by physical and X-ray findings. The location of this hernia lends itself favorably to an osteoplastic procedure. The procedure used here suggested itself by the ease with which intercostal spaces are sometimes obliterated in an aperiosteal resection.

Operation.—Operation was performed under gas oxygen anaesthesia, preceded by morphine, grs. $\frac{1}{4}$, and atropine sulphate, grs. $\frac{1}{150}$, given hypodermically one-half hour before the patient was sent to the operating room. A transverse incision, 5 inches long, was made in the left fourth interspace, extending from the lateral margin of the sternum to the outer border of the hernial mass. The fibres of the pectoralis major muscle were divided, the thin, friable, tissue paper-like sac of parietal pleura then presenting itself was perforated in manipulation and a partial pneumothorax produced, but not sufficient to embarrass the patient particularly. The intercostal soft parts were so atrophic and the pleural sac so thin and friable that they were entirely disregarded in the repair.

The repair was accomplished by turning the perichondrium and osteum of the anterior surface of the fifth costochondral flap upward into the fourth interspace, forming the bed for an osteochondral flap of the fourth rib, which was turned down on the hinge of its periosteum and perichondrium by splitting it in two from above downward with a heavy scalpel. The flap was held in place by four interrupted sutures of No. 2 chromic gut, three of which were inserted through the osteochondral flap of the fourth rib into the fifth rib, and one from the sternal end of the rib flap to the sternum. Considerable care was taken to control bleeding. The pectoralis major muscle was closed with No. 3 plain interrupted gut sutures and the skin with an interlocking silk suture. A gauze dressing was applied, covered by a felt pad and held in position by 3-inch adhesive straps going entirely around the chest.

The patient had very little post-operative reaction. He was walking on the second day. The cough stopped immediately. Sixteen days after the operation there was a definite, hard, board-like plaque obturating the original hernial orifice and X-ray demonstrated callus.

In this case we have definitely proven the operability of pneumocele of this type

HERNIA OF THE LUNG

and position. There is no reason why this method of repair would not be equally successful in other locations.

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SOME CONSIDERATIONS PERTAINING TO THE DIAGNOSIS AND SURGICAL TREATMENT OF DISEASES OF THE GALL-BLADDER

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GALL-BLADDER diseases present a series of problems both in regard to their diagnosis and to the indicated mode of treatment, final judgment regarding the solution of which is still *sub judice*.

As for the diagnosis, perhaps in the case of no other organ is it so difficult to identify the seat of the pathological condition from the presented symptoms. It is true that repeatedly in the literature we find the classical symptoms of gall-stones described and yet repeatedly we encounter patients who present these so-called classical symptoms but in whom operation has demonstrated that they were due to acute appendicitis, to a kidney stone, to Dietl's crises, to a perforated gastric ulcer. And if the diagnosis is to some degree uncertain in the "classical" cases, to a far greater degree is the nature of the condition masked in cases which present only general, vague symptoms which may be due to almost any visceral disorder.

And when we turn from diagnosis to treatment, we find fundamental differences of opinion between the internists and the surgeons as to which cases should be submitted to medical treatment and which to operation, and among the surgeons themselves there are differences of opinion regarding the preferred surgical procedure in certain types of cases.

It is my purpose in this paper, therefore, in place of a formal presentation of any phase of the manifold problems presented by gall-bladder disease, to discuss only certain points pertaining to the diagnosis and treatment of gall-bladder disease as they have been emphasized in the experiences of my associates and myself in 1405 cases and as they have been suggested by the questions which have been asked at various medical meetings before which I have been privileged to discuss this general problem.

It is of interest to note that the problems presented by gall-bladder disease are not new problems. Many of those with which we are most concerned to-day have been recognized since the first operations for gall-bladder stones were performed in the United States—by John Stough Bobbs, in 1868, Marion Simms in 1878, and by Lawson Tait, in England in 1879, and even in the later literature which has appeared since that time we find attempts to answer such still familiar questions as the following:

Is the gall-bladder a comparatively functionless organ?

Is infection the prime cause of gall-stone formation?

How can cholecystitis and cholelithiasis be differentiated from gastric diseases, appendicitis or kidney lesions?

Is cholecystectomy or cholecystotomy the operation of choice?

What is the most favorable time for operation?

SURGICAL TREATMENT OF DISEASES OF GALL-BLADDER

What is the source and location of new stones which form after cholecystectomy?

Where do stones form primarily?

Many of these same questions I find among questions asked at recent medical meetings.

It would take too long to discuss in detail the differential diagnosis of gall-bladder diseases. I will merely note that the conditions which should be borne in mind in establishing a differential diagnosis in a case in which a gall-bladder lesion is suspected, include such conditions within the genito-urinary tract as renal stones, Dietl's crisis and pyelitis, diaphragmatic pleurisy, acute pancreatitis, acute appendicitis, gastric perforation, a list to which, in a recent paper, Doctor Phillips adds angina pectoris, abdominal angina associated with abdominal arteriosclerosis, pericarditis, epigastric hernia, lead colic, herpes zoster and the gastric crises of tabes. In many of these conditions, the clinical history and an analysis of the symptomatology provide a sufficient clue once the possibility that some one of these various conditions may be responsible is borne in mind.

As for the differentiation from kidney stones and from gastric ulcer in particular, the rôle of the röntgenologist is of prime importance, for it has been our experience that our percentage of correct pre-operative diagnoses increases in direct relation to the amount of study which our röntgenologist devotes to these patients. A number of plates in different positions including one of the genito-urinary tract, in many cases present definite evidence of gall-bladder disease to the trained eye of the röntgenologist. This judgment is by no means always based upon the definite presence of shadows of stones. Thus in some instances plates of the stomach will show deformities of the duodenal cap which are due to direct pressure from an enlarged gall-bladder or to adhesions from the gall-bladder or to reflex spasms of the duodenum initiated by an abnormal gall-bladder. Such pressure deformities and adhesions are not confined to the duodenal cap but in some instances affect the pyloric end of the stomach. Adhesions from the gall-bladder may produce a distortion of the duodenal outline or the duodenum may be displaced by a distended gall-bladder.

A study of the colon may determine the presence of adhesions of the colon to the gall-bladder. Such studies as these demand first the taking of a number of plates of different densities followed by a careful study of the pyloric end of the stomach and of the colon continuously after the ingestion of a barium meal.

Whether suspicious shadows on the upper right side pertain to the kidney or gall-bladder may be determined by comparing the size of the shadow on plates taken in an anterior-posterior position, with that on plates taken posterior-anteriorly. The gall-bladder shadows are usually close to the abdominal wall and considerably smaller when the patient is in the prone than when he is in the supine position. Insertion of opaque catheters in the ureters with pyelograms of the kidney and stereoscopic plates will aid in the

localization of these shadows. In many cases the outline of the gall-bladder is visible as the result of a thickened wall and its pathological contents, although it should be borne in mind that the fact that the gall-bladder may be visualized on an X-ray plate does not necessarily mean that it is pathological.

Whether or not spasm of the pyloric cap is due to a reflex stimulus from a pathological gall-bladder may be determined by giving the patient atropin in sufficient dosage to produce relaxation. In such a case the deformity will be persistent if it is due to a duodenal ulcer. In our experience plates of the gall-bladder will determine definite gall-stone shadows in over half of the cases operated upon; this has been determined by a rigid comparison of all gall-bladder plates taken at the Cleveland Clinic during the past two years with the operative findings.

We believe that in the great majority of cases, X-ray findings, together with the clinical history and the physical examination, will enable us to establish the diagnosis not only of cholelithiasis, but also of cholecystitis. Striking examples of cases in which the X-ray findings plus the history determine the diagnosis are those cases of prolonged and intractable indigestion with so-called gastric crises in which it may appear very definitely that the symptoms are not due to ulcer or tumor or other intrinsic cause. In these cases the X-ray will often reveal the presence of gall-stones. I wish, however, to lay particular stress upon the point that while all the diagnostic methods which are at our command should be utilized, final diagnosis must rest upon their interpretation by clinical judgment based upon extending clinical experience.

As for the treatment, there would seem to be no difference of opinion between the surgeons and the internists regarding the indication for operation in such conditions as acute suppurative cholecystitis, persistent recurring gall-stone colic, perforation of the gall-bladder, obstruction of the common duct from stone, chronic distention of the gall-bladder. The differences of opinion are found in the consideration of cases of gall-stone colic in which the pain is not very severe and the recurrences are perhaps at long intervals, of cases of acute catarrhal cholecystitis, of cases of persistent dyspepsia which present signs of gall-bladder disease. And among the surgeons themselves the principal differences of opinion are expressed in the old controversy between the relative merits of cholecystectomy and cholecystotomy.

In 1902, Roswell Park made the query, "Why should we not treat the gall-bladder as we do the appendix," and he concludes:

"Whether, then, the case be acute and fulminating or chronic and growling, I would say that the diseased and troublesome gall-bladder like the diseased and troublesome appendix should come out and that we should now formally include a cholecystectomy as the ideal operation corresponding to appendicectomy. My past year's experience with a relatively large number of these cases has taught me that one is no more dangerous than the other and is equally satisfactory. I now scarcely think of leaving an evidently diseased gall-bladder after exposing it any more than I would think of partial operation upon the appendix."

SURGICAL TREATMENT OF DISEASES OF GALL-BLADDER

As I have stated above, throughout all these years the battle has raged between the proponents of cholecystectomy as opposed to cholecystotomy, the ultimate basis of the dispute apparently resting upon final decision as to whether or not the gall-bladder is or is not an essential functioning organ. In our own experience we believe that in too many cases, the gall-bladder which has only been drained continues to give trouble so that its later removal is necessitated. It is our practice, therefore, to remove it under the following conditions: After there has been an acute attack of cholecystitis; in the presence of a stone in the cystic duct or evidence of the former presence of the stone; if the gall-bladder walls are thickened. If the gall-bladder presents a normal appearance and the patient presents no history of a previous acute cholecystitis, the gall-bladder is left. There are those still, who, like Park, advocate the removal of the gall-bladder under all conditions just as the appendix is routinely removed on the basis that since good health is possible without it, it is a mistake to leave it as the possible seat of later trouble. As Judd has shown, however, in the absence of the gall-bladder, the common duct to some extent acts in its place for the storage and concentration of bile and, therefore, shows a tendency to become dilated; and as a storage viscus there will exist within it the same tendency for stone formation as formerly existed in the gall-bladder. For that reason, as Crile has stated, "it would seem far better to take a remote chance of future recurrence of trouble in the gall-bladder than a considerable chance of the occurrence of common duct stones."

Figures from the literature might be cited to show the general basis for considering cholecystectomy to be in general the preferred procedure. The statistics of the Mayo Clinic, as recently reported by Judd in an extensive study of the mortality following operations on the liver, pancreas and biliary passages, give emphatic evidence in support of their contention that cholecystectomy is in general the operation of choice.

In our own series of operations on the gall-bladder performed since 1919, which includes 400 cholecystectomies and 129 cholecystotomies, the operative mortality in the former series—cholecystectomies—was 1.7 per cent., while in the latter—cholecystotomies, it was 6.9 per cent. In a follow-up study of our total series—those before as well as those since 1919, we have heard from 524 patients, 271 of whom had had cholecystectomy and 253 of whom had had cholecystotomy. Among these, 8 per cent. of the patients who had had cholecystotomy reported that they had had a subsequent operation on the gall-bladder; while only 1.9 per cent. of the patients in whom cholecystectomy was performed had had a subsequent operation for the removal of stones.

Our reason for the division of our statistics into these two periods—before and after 1919, has been the change in our own opinion as to the relative merits of these procedures, which is shown by the fact that prior to 1919 in a total of 876 operations, 255—29 per cent. were cholecystectomies and 621—71 per cent. were cholecystotomies; while since 1919 among 529 operations 400—75.6 per cent. have been cholecystectomies and

only 129—24.4 per cent. have been cholecystotomies. These figures show an exact reversal of our former judgment.

It may be well to add a word regarding the treatment of acute cholecystitis when the patient is in a desperate condition. In such cases we believe that the primary procedure should be a cholecystotomy for the establishment of drainage only, the removal of the gall-bladder being deferred until the condition of the patient warrants the major operation. It should always be borne in mind that the safety of the patient is our prime consideration; the condition of the individual case, therefore, is the final criterion, in accordance with which the choice of operative procedure must be made.

A word may be added at this point regarding the treatment of jaundiced cases. In these cases, as has been emphasized by Judd and his associates at the Mayo Clinic, in particular, the prime danger is hemorrhage due to the lengthening of the clotting time of the blood. If operation is delayed until therapeutic measures have brought the clotting time within safe limits, the danger of operation in these patients is by so much diminished. In the Cleveland Clinic Hospital as a routine measure with jaundiced cases, we begin at once the administration of 10 grains of calcium lactate by mouth every four hours. If the clotting time is more than five minutes, 10 c.c. of a 5 per cent. solution of calcium chloride is given intravenously once a day for three successive days in addition to the calcium lactate. A high caloric, low protein diet is given at frequent intervals—every two hours—during the day and preparation is made for two transfusions to be given, one before and one after operation, or both after operation, according to indications. If there is complete absence of bile in the stools, from 60 to 90 grains of desiccated ox bile is given daily. I may add that in our judgment, no patient should be operated upon during an acute attack whether jaundice is present or not, unless the symptoms indicate the presence of empyema in the gall-bladder.

In those cases in which drainage only is indicated as a primary and perhaps as the only surgical procedure, the importance of sufficiently prolonged drainage should be emphasized. The drainage should be continued until the bile is bacteria free. Disappearance of the bacteria may be hastened by frequent irrigation of the gall-bladder through the drainage tube.

The question as to whether or not the appendix should be removed as a routine procedure is not definitely settled, although it is the practice, I believe, of the majority of surgeons. In my own judgment the appendix should be examined and removed if there are any signs of abnormality. Unless the cæcum is sufficiently mobile for the appendix to be readily brought into the incision for the gall-bladder operation, the usual McBurney incision should be made rather than an extension of the gall-bladder incision, thus on the one hand avoiding any undue tugging upon the attachments of the cæcum, and on the other, avoiding division of the nerves supplying the rectus muscle and diminishing the possibility of a ventral hernia.

Among the possible unfortunate occurrences which may be incident to a

SURGICAL TREATMENT OF DISEASES OF GALL-BLADDER

gall-bladder operation are interference with the circulation of the splanchnic veins, hemorrhage, free bile in the peritoneal cavity. The principal cause of the first of these is heavy packing with gauze bearing down upon the surface of the liver—a cause which suggests its own remedy. The control of hemorrhage is peculiarly essential in these operations. It is for this reason that the precautions described above in the case of jaundiced patients are especially important. Bile in contact with free peritoneal surfaces has a destructive effect which is often unappreciated; and when it is absorbed into the system, of course, the general effects of jaundice will be produced. It is for these reasons that the protection of the peritoneal cavity against any bile leakage is especially important. It is therefore imperative that if cholecystectomy is to be performed the gall-bladder should not be open, and that if cholecystotomy is to be performed, leakage-proof drainage should be established.

The treatment which should follow cholecystectomy depends to a large extent upon the clinical course of the individual case. In general, a cholesterol-free diet is indicated and milk of magnesia is of value as a laxative and antacid. A carefully planned hygienic regimen should be prescribed and the patient should be urged to report to his family physician or to the surgeon at sufficiently frequent intervals for the early recognition of any untoward sequel.

The occurrence of pain shortly after operation—pain which may simulate that of gall-stone colic, may be due to the presence of stones in the hepatic ducts which were not discovered at the time of operation or may be due to the presence of mucus. In such cases the patient should be placed under medical treatment which in general consists in a carefully restricted diet consisting principally of cereal, milk and fruit juices and the application of hot packs over the gall-bladder region; control of pain when necessary by codein or even morphin; gradual increase in the diet as the pain subsides. That is, the treatment should be that which is generally indicated in cases of acute cholecystitis.

It may be well to add a note regarding various apparently unrelated conditions which are sometimes relieved by operation upon the gall-bladder, although it is difficult to understand exactly how this relief is produced. Two such conditions may be mentioned in particular—functional diabetes and asthma. The occurrence of backache is more easily understood when one considers the nerve centres which are closely associated with the gall-bladder and the liver.

This latter associated condition is well illustrated by a recent case in which there was intense pain which extended around the chest and base of neck. The patient felt as if she were held in a vise. She felt worse when lying down and could not lie at all except on the left side. As her skull had been fractured ten weeks before in an automobile accident, it appeared as if this pain must have been associated with that injury. On account of the fact that there was some deformity of the spine the patient was referred to the orthopaedic department. An X-ray of the spine, however, while it revealed an arthritis, did not show any evidence of a fracture, and therefore a gastrointestinal examination was made to determine if possible the underlying cause of the

FRANK E. BUNTS

arthritis. In the latter examination definite gall-stone shadows appeared on the X-ray film. Cholecystectomy was performed, and several black faceted stones were found in the gall-bladder which on pathological examination gave evidence of chronic productive cholecystitis. The patient made an excellent recovery not only from the operation, but also from the severe backache.

This case has been cited in detail not only as an illustration of the fact that backache may be due to a pathological condition in the gall-bladder, but also to emphasize the fact that the gall-bladder may be the site of an infection which is the primary cause of apparently unrelated conditions. When a focus of infection is being sought, therefore, the gall-bladder should not be overlooked, especially when other possible foci, such as the teeth, sinuses, tonsils or appendix have failed to be incriminated.

Additional data of interest which has been secured from a study of our cases are that 71 per cent. were in women; and that the highest incidence was between the ages of 30 and 40; 29 per cent. were between the ages of 30 and 40, and 75 per cent. between the ages of 30 and 60. That is, gall-bladder disease does not appear to be a disease of either youth or of old age.

Whatever may be the point of view of individual surgeons regarding the problems which I have mentioned above, the sum of the whole matter has been expressed in a recent paper by my associate, Doctor Phillips, who, after having discussed certain causes of the failure of gall-bladder operations to cure the patient, and assuming for the internist as well as for the surgeon the responsibility of preventing these failures, says: "On the surgeon rests the responsibility for improving the technic of his operations that he may secure better results. After operation he should refer these patients back to the internist so that they can be kept on a proper dietary and hygienic regimen instead of saying to the patient as is so often done, 'the cause of your trouble has been removed, you can eat anything you wish.'"

If this responsibility is fully assumed it will mean that we shall not adopt any hard and fast rule for the treatment of any case, but the consideration of each case will be strictly individualized and the surgeon's best clinical judgment plus the aid of all available methods of diagnosis will be used as a guide to the therapeutic measure to be applied.

WANDERING SPLEEN WITH TORSION OF ITS PEDICLE

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AXIAL rotation of the spleen upon its pedicle is recorded in the literature in the cases of about seventy women and in three males. This condition was first reported in a man by Petridis in 1918. During the next year Pieri performed a splenectomy on an Italian soldier for this disease; and Southam, in 1921, submitted the report of a case in an English boy of six years. After a careful search of the literature no cases have been found occurring in the male in the United States.

On December 17, 1924, a boy aged thirteen years, was admitted to the Bellevue Hospital complaining of severe generalized abdominal pain of twenty-four hours' duration. Early in the morning of the previous day he was awakened from a sound sleep by intense cramp-like pain in the epigastrium. He vomited several times but the pain continued. During the morning a good bowel movement gave slight relief for a short time. Several hours before coming to the hospital his pain became more intense in the right lower abdominal quadrant. He was seen by his family physician, who sent him to us with the diagnosis of "probable acute appendicitis."

On the day prior to the onset of his abdominal pain the patient had a chill and an intensely sore throat developed. Up to the time of this illness he had attended school regularly, had done no violent exercise, and had not fallen or injured his abdomen. There was no history of previous abdominal pain, indigestion or constipation. His genito-urinary history was negative.

Physical examination showed a normally developed and nourished boy with a flushed face who appeared to be acutely ill, lying quietly in bed, but with his thighs flexed on the abdomen. His temperature was 102.8° F., pulse 120 and respirations 24. There were no abnormalities of the eyes, ears or nose. The tongue was slightly coated. Both tonsils were markedly swollen and red, with many of the crypts filled with purulent exudate. The neck was normal. His lungs were clear. The heart was normal in size, but the sounds at the apex were of a slapping character, and in this area there was a soft blowing systolic murmur which was transmitted neither to the axilla nor to the base. The abdomen was flat, symmetrical and held rigidly throughout its entire extent. On palpation there was acute tenderness in the region of the cæcum and sudden release of pressure produced acute pain. Pressure over the splenic flexure of the colon did not produce pain at McBurney's point when the patient coughed. Across the entire lower abdomen the muscles were held very tensely and what appeared to be board-like rigidity was present. No masses were recognized by abdominal palpation. A rectal examination unfortunately was not made.

His blood showed 28,000 white cells per cubic millimetre with 90 per cent. polymorphonuclear leucocytes and 10 per cent. lymphocytes. A urine examination showed no abnormalities. A provisional diagnosis of acute peritonitis secondary to acute appendicitis was made and the patient was prepared for an immediate operation.

Under nitrous oxide, oxygen and ether anæsthesia a five-inch lower right rectus incision was made and the muscle retracted laterally. On incising the peritoneum there was a gush of thin cloudy fluid. The coils of small intestine were moderately dilated, but the serosa was glistening and not inflamed. The appendix was normal. The

ascending, transverse and sigmoid colons were dilated to about twice their normal size. Occupying and completely filling the pelvis was a mass which was recognized to be the spleen. It was enlarged to more than three times its normal size. The surface was smooth, glistening, free from fibrin or adhesions, and its color was bluish-black. The pedicle, on which it had rotated 360 degrees, was ten inches long and looked like a large umbilical cord. No pulsations could be felt at the hilus of the spleen. In the region of the tail of the pancreas the pedicle was a soft cord in which pulsations could be felt. Distal to the site of torsion, which was at about its midpoint, the pedicle was very swollen and oedematous. The spleen was easily delivered from the pelvis and after enlarging the incision it was removed from the peritoneal cavity. The pedicle was triply clamped close to its base and divided between the two distal clamps. The stump was then transfixed and ligated with number 2 plain catgut which was reinforced by a ligature of number 2 chromic gut. After removing as much fluid as possible by suction, the abdomen was closed in layers without drainage. Cultures from the peritoneal fluid and from the cut surface of the spleen showed staphylococcus aureus and a gram-negative bacillus. Microscopic examination of the spleen showed intense congestion but no other abnormalities.

The convalescence was uneventful. Under hot saline throat irrigations the tonsillitis promptly subsided. The evening temperature on the first post-operative day was 101° F. and after the third day the temperature curve was flat. The wound healed by primary union. On the fourteenth post-operative day the patient was sitting in a chair and three days later he was discharged from the hospital.

A complete blood count three hours after the operation showed: red blood cells 5,020,000, haemoglobin 88 per cent. (Dare), white cells 31,700 with 88 per cent. polymorphonuclear leucocytes, 7 per cent. lymphocytes and 3 per cent. transitional cells. On the fourth post-operative day the haemoglobin had fallen to 78 per cent. (Dare) and the red blood cells numbered 3,920,000. The white blood cells had decreased to 16,000, with 78 per cent. polymorphonuclear cells, 18 per cent. lymphocytes, 3 per cent. large mononuclear cells and 1 per cent. eosinophiles. On the ninth post-operative day the haemoglobin had increased to 94 per cent. (Dare) and the red cells were 4,960,000. The white cell count showed 17,200 cells with 77 per cent. polymorphonuclear cells and 22 per cent. lymphocytes.

Six weeks after discharge from the hospital (February 15, 1925) the patient was reexamined. He said that he had returned to school and was feeling perfectly well. He had had no indigestion, constipation, pains or aches in any of his bones or joints. His appetite was excellent and he thought that he had gained some weight. He and his family had noticed that the color of his face and lips had markedly improved. There had been slight discomfort in the region of his abdominal scar on changes of weather. He presented the picture of robust health. His cheeks and mucous membranes were of a healthy red color. There was a slight keloid formation in the scar but there was no weakness of the scar or the adjoining muscles. A complete blood count at that time showed a haemoglobin of 100 per cent. (Dare) and a total red cell count of 5,100,000. The white cells numbered 14,800 with 59 per cent. polymorphonuclear cells, 40 per cent. lymphocytes, 0.6 per cent. eosinophiles and 0.3 per cent. basophiles. All of the red cells stained uniformly, were of normal size and contour and there were no abnormal forms seen.

On March 15, 1925, a second follow-up examination showed the same physical condition and the boy had no complaints. His haemoglobin had reached 105 per cent. (Dare) and the total number of red cells was 5,100,000. The white cells numbered 10,200 and the differential count showed 50 per cent. polymorphonuclear cells, 42 per cent. lymphocytes, 5 per cent. transitional cells and 3 per cent. eosinophiles.

In reviewing this case it is interesting to note the sudden acute onset and the course which simulated acute appendicitis with peritonitis. The lower

WANDERING SPLEEN WITH TORSION OF PEDICLE

abdominal resistance which before operation was interpreted to be board-like rigidity was unquestionably the resistance offered by the spleen itself. On opening the abdomen the displaced organ was very near the anterior abdominal wall and had the muscles been relaxed, it would have been easily palpable. Under the light anaesthesia employed at the start of the operation this muscular resistance was maintained. The spleen was held by no adhesions and was easily removed from the peritoneal cavity. Its pedicle was cord-like with its base at the tail of the pancreas. There was no evidence of pancreatic tissue in the splenic stalk. This supports the writer's view that this was a case of congenital elongation of the pedicle of the spleen.

The acute tonsillitis may be mentioned as a possible etiological factor. In such acute infections an enlargement of the spleen has been observed. This enlargement and increased weight of the displaced organ may have been a contributing factor in producing the acute torsion.

Immediately following the operation there was an appreciable increase in the total number of white cells per cubic millimetre. No abnormal red blood cells were seen at any time. On the fourth post-operative day the hæmoglobin (78 per cent.) and the red cells (3,920,000) had fallen to the lowest point. Following operation there was a steady decrease in the percentage of polymorphonuclear cells and an increase in the percentage of the lymphocytes. Three months after operation the hæmoglobin was 105 per cent. and the red cells numbered 5,100,000. At that time the total number of white cells per cubic millimetre was 10,200 with 50 per cent. polymorphonuclear cells and 42 per cent. lymphocytes.

Splenoptosis has been found almost exclusively in the female, and it was not until 1914 that the condition was first observed in the male by Lanz. The spleen may become displaced because of a congenitally long pedicle or on account of an acquired attenuation of its ligaments. Congenital elongation of the pedicle is said to be a rare condition, but the displacement in the case herewith reported is believed to have been due to such an elongation. Of the seventy odd cases of torsion of the spleen found in the literature all but three occurred in women. General or partial viceroptosis was associated with splenoptosis in many of these cases. According to Allbutt, of all cases of viceroptosis only 2 per cent. of the patients show splenoptosis. Pregnancy with the general relaxation of the abdominal walls favors the development of this condition and may in part explain the greater frequency of splenoptosis in women. Hypertrophy of the spleen has in many cases been a contributing factor, but many spleens enlarged by malaria and other diseases are found in normal position, although enormously enlarged. Malarial spleens are, however, frequently ectopic and a number of cases have been reported in which such spleens have undergone rotation upon their pedicles.

The ectopic organ may occupy any region of the peritoneal cavity, limited in its excursions only by the length of its pedicle. The variation in position and the range of motion enjoyed by the ectopic spleen is greater than that of any other viscus. Morgagni has reported the presence of the spleen in

the sac of an inguinal hernia. During change of position the viscus may float about against the action of gravity, and Bland-Sutton has aptly compared its movement to that of a boat upon the crest of a wave, since the spleen seems to float upon the intestines. When the patient assumes the upright position, gravity plays a more important part in determining the location of the organ.

Chronic engorgement of the spleen is favored by its abnormal position and mobility; this results in hypertrophy. Traction upon the stomach and pancreas leads to recurring attacks of indigestion, with or without nausea and vomiting, and pain in the epigastrium and left hypochondrium. In one case reported by Govseieff, quoted by MacDonald and Mackay, traction coincident with acute torsion of the spleen resulted in necrosis of a portion of the fundus and the body of the stomach. Treves has reported recurring attacks of jaundice as the result of traction exerted by a wandering spleen upon the biliary passages. Traction upon the tail of the pancreas has resulted, in many cases, in the elongation and displacement of that organ. Pancreatic tissue has been found in the stalk of the spleen in varying amounts. In some of the cases the tail of the pancreas was in contact with the hilus of the spleen and in others the extent was not so great. Pressure of the spleen upon loops of intestine and constriction of the gut by the cord-like pedicle favors intestinal stasis upon which an acute obstruction may develop. The pelvis position of the spleen has in most cases caused a retroversion of the uterus and in one case reported by Kouever there had occurred a complete prolapse of the uterus and the urinary bladder. In over 60 per cent. of the reported cases of pelvis spleens the organ lay between the uterus and the bladder. On account of the pressure upon, and the displacement of, the pelvis organs, various menstrual and bladder symptoms with pelvic discomfort have been reported. In a number of cases a movable tumor has been observed in the abdomen by the physician or by the patient and at subsequent operation this tumor has proved to be the spleen. At times the wandering spleen has been observed to retreat upward under the costal margin where it remained for days or weeks. Blesh observed an abdominal tumor which increased in size with each digestive cycle and at operation this was found to be an ectopic spleen.

The gravest danger to the ectopic spleen is the acute rotation upon its pedicle, which is favored by the free mobility and increased size of the organ. Chronic torsion may exist for some time without producing changes other than congestion and consequent enlargement of the viscus. In a number of cases acute torsion has occurred following muscular effort or abdominal trauma, while in others the condition has developed without apparent cause. The symptoms are those of a major abdominal catastrophe. The onset is sudden and manifests itself by acute stabbing or cramp-like epigastric pain accompanied by nausea and vomiting. Abdominal tenderness and rigidity quickly develop. The temperature may be slightly elevated and the white blood cells are usually moderately increased in number. The patient is

WANDERING SPLEEN WITH TORSION OF PEDICLE

severely shocked and appears acutely ill. In case an abdominal tumor has been previously observed, it will be greatly enlarged if it is the twisted spleen.

The first result of the torsion is the compression of the splenic vein and the rapid engorgement of the organ. Later this is followed by occlusion of the artery with thrombotic changes and infarction of the spleen. Coincident to these vascular changes there is an abundant serous exudate poured into the peritoneal cavity. Hartmann has rightly described this condition as an aseptic peritonitis. The peritoneal fluid is at first clear; later it appears hemorrhagic or cloudy. As time goes on and if relief is not given by operative interference, a true septic peritonitis develops. During torsion one or more intestinal loops may become involved with the pedicle, as in the case of O'Shea, adding an acute intestinal obstruction to the already serious condition of the patient. In the reported cases the degree of rotation of the spleen has varied from a quarter turn to four complete revolutions upon its axis. The pathological changes in the spleen as the result of the occlusion of its vessels are well known and have varied from congestion to complete gangrene.

With few exceptions the diagnosis of this condition has not been made prior to operation. Pre-operative diagnoses have been varied and numerous; including twisted ovarian cyst, kinked hydronephrosis, acute intestinal obstruction, acute peritonitis, hæmatocele, mesenteric and omental cysts, congenital sacrococcygeal tumor, acute perforation of the gastro-intestinal tract, and acute appendicitis. The knowledge of the existence of a wandering spleen previous to the onset of the acute illness would aid materially in making the diagnosis. In the few cases diagnosed this information was available. In many of the reported cases there was a palpable tumor in the abdomen, but its true nature was not suspected. In cases in which there is a palpable tumor, Hartmann advises the use of Trendelenburg's position to determine the mobility of the mass and to observe its change in position. If it moves upward to the left hypochondrium, he believes that a movable spleen should be strongly suspected. Absence of attachment between the tumor and the pelvic organs, if demonstrated, would rule out ovarian or uterine conditions. The wide range of motion of the tumor and the absence of urinary symptoms and ureteral colic should make kinked hydronephrosis seem unlikely. Fluoroscopic examination of the patient in the upright position would in most cases rule out perforations of the gastro-intestinal tract. In this manoeuvre free gas in the peritoneal cavity is collected under the vault of the diaphragm and can be seen as a clear, light crescentic area below the dark shadow of the diaphragm. In suspected cases of acute appendicitis, a test which is of value is the application of pressure over the splenic flexure of the colon with the right thigh flexed on the abdomen with the leg extended on the thigh. When the patient coughs, in the presence of an acutely inflamed appendix, acute pain is felt at McBurney's point. In women when the spleen occupies the pelvis, the uterus is usually retroverted and the organ is palpable through the anterior vaginal wall.

The treatment of choice is splenectomy. This has been done in the great majority of the reported cases, and it has been a relatively simple operation because of the absence of adhesions fixing the spleen. In one case reported by Bland-Sutton and in another reported by Conklin, the torsion was relieved by untwisting the spleen on its pedicle. In both patients the torsion recurred and the spleen was then removed. Splenopexy offers technical difficulties in the fixation of an abnormal viscus and Hartmann believes that such fixation results in further enlargement of the organ. Treves in his *Manual of Operative Surgery* mentions the fact that he has done this operation in two cases, but there are no notes regarding the end results. The removal of the spleen when it is found twisted upon its pedicle is the only rational method of treatment. By this operation the patient is cured and there is no danger of a recurrence of this serious condition.

SUMMARY

1. Axial rotation of the wandering spleen is not a common condition. It has been observed in seventy odd women and in four males.
2. Torsion is favored by the free mobility of the organ and not primarily by its increased size. A certain number of patients gave a history of muscular effort or abdominal trauma before the onset of the acute torsion, while in an equal number the attack developed without apparent cause.
3. This condition produces all of the symptoms of a serious abdominal condition.
4. Occlusion of the splenic vein occurs first. This results in enormous enlargement of the viscus from passive congestion and an abundant clear peritoneal exudate. This fluid is at first clear and sterile; later it becomes cloudy, hemorrhagic and septic. The changes observed in the spleen have varied from intense congestion to gangrene of the organ.
5. Diagnosis is difficult and the condition has frequently been mistaken for twisted ovarian cyst, kinked hydronephrosis, intestinal obstruction, acute peritonitis, acute appendicitis and acute perforations of the gastrointestinal tract.
6. The most satisfactory treatment is splenectomy.

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SPONTANEOUS RUPTURE OF THE SPLEEN

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THE following case of spontaneous rupture of the spleen serves to emphasize the rarity of the condition. It is surprising that the literature on the subject offers no explanation for the occurrence of the condition in the spleen. The purpose of the present report is not only to add a new case to the literature, but also to offer an explanation for this phenomenon.

History.—A woman, aged thirty-two years, was admitted to the service of Doctors Campbell and Sigworth in the Lutheran Hospital of Norfolk, Nebraska, with a history of abdominal pains and acute diarrhœa of seven days' standing. At the time of her admission to the hospital, the diarrhœa had apparently ceased; however, her abdominal pains continued.

Past History.—Four years ago, in 1920, she had an attack of gastro-intestinal pains, as seen in patients with gall-bladder disease. No previous history of typhoid fever, malaria or any other ailment was elicited at that time. Cholecystectomy and appendectomy were performed at that time. After this she remained in good health until her present illness.

Present History.—Patient was seized with an attack of diarrhœa similar to the "summer diarrhœas" that were rather common in the community during the hot summer months. Diarrhœa lasted four days. Under the usual treatment, the diarrhœa disappeared; however, her abdominal pains continued. The pain was at first limited to the gall-bladder area. Neither hot packs nor any other remedy employed brought to her any relief. Hypodermic administration of morphine was resorted to for two days. Her temperature ranged from 99.6 to 102, pulse 80-103. Blood-pressure, systolic 125, diastolic 75. She was relieved from pain for five days; soon after, the pain localized in the left hypochondrium; three days later her pain became severe and she went into shock, presenting the appearance of one exsanguinated. The examination of the heart and lungs was negative throughout. At the time of onset of shock she complained of intense aching through left shoulder. In the abdomen there was no rigidity at first; twenty-four hours after onset of shock a mass in left hypochondrium could be felt; mass of indefinite contour; very tender and some rigidity after first day.

That an intra-abdominal hemorrhage had taken place was evident. On opening the abdomen an estimated amount of 700 c.c. of blood and clots were found free in peritoneal cavity. The bleeding was from spleen, which organ was adherent to the diaphragm by rather dense fibrous bands. After a transfusion of 600 c.c. of blood, splenectomy was done. The patient made an uneventful recovery and left the hospital at the end of three weeks.

Pathological Report.—Spleen weighs 230 grams; is of grayish color, capsule wrinkled, and in several places shows soft fibrinous tags. The spleen is notched, having five distinct notches. Between two of these there are seen sub-capsular hemorrhages; at the bleeding points the capsule is torn; the tears extending into the interior of the organ. Upon incision the pulp is soft, a gray-red in color; trabeculæ not visible; Malpighian bodies obscure; granular material can easily be scraped off from surface of spleen.

Microscopical examination shows capsule to be thickened and in places to have undergone hyaline changes. No nuclear structures of fibroblasts can be made out; throughout the capsule there are seen a number of large polymorphonuclear leucocytes

SPONTANEOUS RUPTURE OF THE SPLEEN

containing pigment (haemosiderin), likewise there is scattered throughout the capsule free pigment. The pulp is the seat of many mononuclear and endothelial cells; there are also seen a number of polymorphonuclear leucocytes, and red blood cells. The media of the blood-vessels are thickened and reveal hyaline changes; the endothelial cells of the intima are proliferated, giving the picture of being lined by large epithelial cells. The lumina of the blood-vessels are filled with free red blood cells and leucocytes.

Comments.—Rupture of the spleen is of infrequent occurrence. Crawford¹ states that out of 16,000 post-mortems he has only observed one case. Noland and Watson² have found only three instances of spontaneous rupture of the spleen out of clinical and autopsy records of approximately 30,000 malaria cases admitted to the Colon Hospital of Panama Canal zone during eight years.

This great rarity does not apparently represent the true incidence of the condition. The disease is of surgical nature and the surgeon rather than the pathologist would be more apt to see these cases. Secondly, since the introduction and the improved technic of splenectomy and blood transfusions in these cases, the number of recoveries have increased. Thus Leighton³ gives a mortality rate of 12.44 per cent. of cases operated on by five different surgeons. Brogister,⁴ in 1909, reviewed the literature on traumatic rupture of the spleen and stated that up to date there has been reported 203 cases treated by surgical means. The mortality after splenectomy was 35.5 per cent. for rupture of previous normal spleen and 33.3 for diseased spleen. Barnes⁵ analyzed the literature since Brogister's paper and found the mortality to be 7.6 per cent., a rate more in accordance with that of Leighton. The discrepancy in the figures can be accounted for by the difference in the pre-operative condition of the patients. The majority of the cases reported can be traced as distinctly resulting from some form of trauma, occurring in persons with a previous diseased spleen. The Orient claims a great percentage of the reported cases. This is most likely due to the fact that natives have large spleens probably on account of the prevalence of diseases in the tropics, that are associated with splenomegalia, such as malaria, Kala-azar, Malta fever, relapsing fever, etc. Berger⁶ collected 123 cases of traumatic rupture of the spleen, and out of this number 99 cases showed malaria. It is interesting to note that the cases reported by McCracken⁷ and Price⁸ came from Shanghai, which according to the former suggests the possibility of modern industry having a bearing upon the more frequent occurrence of rupture of the spleen in the seaport of Shanghai.

The occurrence of spontaneous rupture of previously healthy spleen during an acute illness is exceedingly uncommon. We were able to collect from the literature twenty-seven cases. The case reported above would bring up the total to twenty-eight cases. This group includes the fourteen cases that occurred during the course of typhoid fever, thirteen of which were recently collected by Melchoir.⁹ Additional cases were reported since by Shorten¹⁰ and Diehl.¹¹

The function of the spleen is still a mooted question; yet there are a number of true facts known regarding the changes the spleen assumes in certain pathologic states of the body, and *vice versa* changes in other organs that are brought about by disease in the spleen as well as following removal of the organ that we cannot help but realize that the spleen as an organ is exposed to continual wear and tear. A detailed discussion of the various functions of the spleen has been considered by the author.¹²

Indeed the histological study of the latter offers proof for the early aging of the organ. Gross¹³ finds that from the age of thirty on, the capsule in practically every spleen studied reveals considerable hyaline changes of its connective tissue. The nuclei of the fibroblasts disappear and the fibrils become thickened and few. The blood-vessels likewise undergo a gradual thickening, particularly of the media and intima, consisting of connective tissue and hyaline. This is rather remarkable that a splenic blood-vessel should undergo hyaline changes at such an early life.

The capillaries that permeate the Malpighian corpuscles become thickened and later hyaline so that at thirty-six years practically 50 per cent. of spleens show instead of one arteriole, a number of more or less thickened and tortuous vessels coursing through each Malpighian corpuscle.

The amount of lymphoid tissue falls steadily from birth; because of the gradual collapse of the tissue, however, there appears gradual increase of pulp with increasing years. Because of these changes there occurs a decrease in the power of constructive metabolism, which factor contributes to the senescence of the organ. This is in accordance with Child's observation,¹⁴ that anything that decreases the rate of metabolism such as decrease in permeability, increase in density, accumulation of relatively inactive substances leads to senescence.

During the course of an acute infection, such as typhoid where the spleen is large and red or other bacterial infections associated with a large gray spleen, there is a predominance of large mononuclear cells with an increase of the protoplasmic rich pulp cells in the former, and an increase in polymorphonuclear, pulp cells and endothelial cells in the latter; thus the spleen enlarges, giving rise to the splenic tumor of the acute infections. In a person past thirty years of age, the spleen by virtue of the histological changes incident to its aging, as indicated above, would be more apt to rupture, particularly if trauma or even too violent a palpation of the organ are applied. The reported cases of ruptured spleens would bear out this point; the average age reported being 37.6 years.

The histological picture of spleen of our case shows distinct hyaline changes of its capsule, the blood-vessels are thickened and likewise reveal hyaline changes.

As a practical point it would appear that one should exercise care not to palpate the spleen too violently during the course of acute illness, particularly in a patient past the age of thirty-six years.

SPONTANEOUS RUPTURE OF THE SPLEEN

CONCLUSIONS

1. Spontaneous rupture of the spleen is of infrequent occurrence, there being twenty-eight cases described in the literature.
2. The probable explanation for the occurrence of the condition in the spleen is to be found in the hyaline changes of the capsule and blood-vessels incident to aging of the organ.
3. Too violent palpation of the spleen in patients with acute infection should be avoided, particularly when the patient is past thirty years of age.

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DIVERTICULA OF THE JEJUNUM*

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THE basis for this paper is the presentation of the following case:

K. G., female, housewife, age sixty-three, was admitted to the service of Dr. J. H. Jopson with a history of having had pain in the stomach for the past fifteen or sixteen years. Pain was cramp-like in character, continued to move across upper abdomen and radiate to left shoulder blade. It would appear two to three hours after eating. These pains would come and last four to six weeks and disappear for a year or more, only to return. In October, 1922, she again began to suffer from her gastric pains. They were again of the same character as before. Since December, 1922, she began to have a feeling of fullness and frequency of vomiting. Vomiting would occur without relation to meals, being preceded by severe attacks of cramp-like pain.

During the interval between October and December, she was treated medically and considerably relieved until the present time. She has not lost weight.

Previous History.—She had several diseases of childhood; she can remember no other illness. She was operated upon by Dr. J. G. Clark for internal injuries following transverse presentation.

Family history is negative. She has five children living and well. Two children died, one of croup, another of diphtheria.

Physical examination revealed a female adult; about sixty years of age; head negative; chest and heart negative; Abdomen: Slight areas of tenderness in the epigastric region, a little to the left of the midline, slightly above the umbilicus. She had no gall-bladder tenderness. Kidneys were negative, as was the appendix. Pelvic examination was negative.

Urinalysis was negative for albumin and sugar. Microscopically showed occasional leucocytes and many squamous epithelium. Blood count showed 4,740,000 reds; leucocytes 6300 and 80 per cent. haemoglobin. Differential blood count showed 42½ per cent. small lymphocytes, 1 per cent. large lymphocytes, 2 per cent. transitionales, 49 per cent. polymorphonuclears; 4 per cent. eosinophiles and 1½ per cent. basophiles. Feces was constantly positive for occult blood. Special examination of the blood revealed: Sugar 108—Creatinine 2.1;—Uric Acid 4.2,—Urea 23.

X-ray Examination.—Report from Doctor Campbell was as follows: "Stomach filled normally and showed no evidence of organic lesion. Greater curvature about 5 inches below iliac crest in the erect posture. No retention at the six-hour period, although peristalsis was sluggish and waves shallow. There is a retention of a portion of the barium meal in the small intestine, apparently near the duodeno-jejunal junction which is constant. (Fig. 1.) It may be due, either to a diverticulum at this location, or old inflammatory adhesions, or a perforated gastric ulcer. In the erect posture the entire colon lies below the iliac crest."

She was operated upon April 18, 1923. Findings at operation were as follows: The liver was ptosed, stomach markedly ptosed. There was an old healed constricting ulcer at the pylorus; stones size of grapes were in the gall-bladder; the jejunum was angulated about four inches, below its origin, due to the presence of a diverticulum extending behind the stomach and to the right of the ligament of Treitz, which on being dissected out from its position, to which it was adherent, measured approximately 1½

* Read before the Philadelphia Academy of Surgery, April 6, 1925.

DIVERTICULA OF THE JEJUNUM

inches in all diameters, being circular in shape, with very broad vessels, communicating by a wide opening with the jejunum on the antimesenteric border 4 inches below the duodeno-jejunal flexure. This explains the persistent shadow in the X-ray above the stomach. The diverticulum was thick-walled, and on section showed a mucosal lining and a fibrous outer coat.

Cholecystectomy and appendectomy were performed in the usual manner, the diverticulum was removed at its base, and this opening used in performing a posterior gastro-jejunostomy. Patient made an uneventful recovery and was discharged on the 9th of May, 1923.

From the articles by Balfour, Helvestine, Watson and others we have been able to collect thirty-three cases of diverticula of the jejunum. Of this

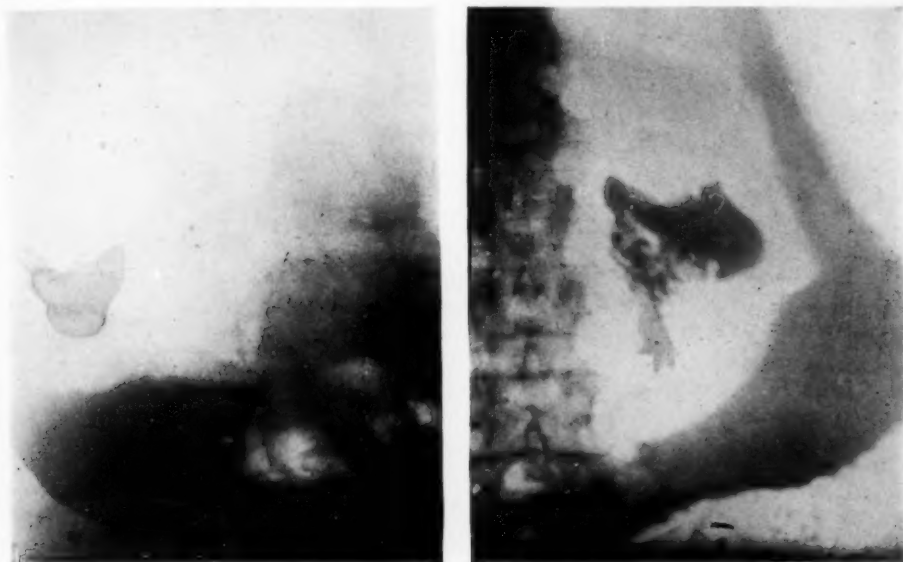


FIG. 1.—Congenital diverticulum of the jejunum in an adult female. It was associated with pyloric stenosis from ulcer, and calculous cholecystitis. Diagnosis of probable diverticulum by Dr. Campbell. Resection of diverticulum, gastro-enterostomy, cholecystectomy. Appendectomy. Recovery. (From Hospitals of the Graduate School. University of Pennsylvania.)

number twenty-one were discovered at necropsy, ten at operation, and no notation of how ascertained in the remaining two cases.

Diverticula may be classified as true and false. The histology of the true type consists of all the coats of the intestine, while the false type lacks the muscular layer. Where this fact was mentioned in the reported cases, there were three true diverticula and eleven of the false type of diverticulum. They were found on the mesenteric border in twenty-one cases and on the antimesenteric border in three cases.

Numerous etiological factors have been considered as responsible for their production. Klebs believed that traction on the intestine by the mesentery was the causative factor. Hauseman attributed them to increased intra-intestinal pressure from the accumulation of gas or fecal material. Graser, to venous congestion causing separation of the muscles of the intestine with a subsequent herniation of the mucosa. Roth considered fatty degeneration of the tunica

NORMAN S. ROTHSCHILD

TABLE I.

Reported by	Date	Ascertained	Age	Sex	Number	Type	Size	Location	Symptoms
Sir Astley Cooper.....	1844	Necropsy	50	Male	Multiple	False	Pea to walnut	Mesenteric	None.
Cornillon.....	1869	Necropsy	30	Female	Single	False	Hen's egg	Mesenteric	None.
Sir Wm. Osler.....	1881	Necropsy	65	Male	Multiple	False	Cherry to apple	Mesenteric	Complained of rumbling sounds and colicky pains after eating.
Moore.....	1883	Necropsy	40	Male	Multiple	True		Mesenteric	None.
Buzzi.....	1885	Necropsy	77	Male	Single	True	23 x 32 mm.	Mesenteric	None.
Buchwald and Janicke.....	1887	Operation	6	Male	Single	True		Mesenteric	Intestinal obstruction.
Virchow.....	1890	Necropsy		Male	Multiple	False	Hen's egg	Mesenteric	None.
Edel M.....	1894	Necropsy	73	Female	Multiple	False	Walnut to apple	Mesenteric	None.
Seippel.....	1895	Necropsy			Multiple	False	Walnut	Mesenteric	None.
Latarjet and Murad.....	1914	Necropsy	50	Female	Single	?	2.5 x 5 cm.	Mesenteric	?
Braithwait.....	1918	Necropsy	45	Male	Multiple	?	Largest 2.5 cm. diameter	Mesenteric	?
Case.....	1920	X-ray and operation	61	Male	12	?	One 5 cm. diameter	?	Gastric discomfort and intestinal flatulence.
Case.....	1920	X-ray and operation	73	Male	?	?		?	Patient was operated on for gall-stones. Diverticulum not removed.
Terry and Mugler.....	1921	Found at operation, for duodenal ulcer	59	Female	Multiple	?	?	?	1½ years after operation for ulcer, developed intestinal obstruction due to enterolith in diverticulum.
McWilliams.....	1921	Necropsy	71	Male	Multiple	?	?	Mesenteric	?
MacKechie.....	1921	Operation	43	Female	Multiple	False	Split pea to pig-con's egg	Mesenteric	Incomplete intestinal obstruction.
Good.....	1895	?	77	Female	Multiple	False	?	Mesenteric	None.

DIVERTICULA OF THE JEJUNUM

Hansemann	1896	Necropsy	14	Male	Single	?	?	Anti-mesenteric to which was attached access. pancreas	?
	1896	Necropsy	?	Male	Multiple 400	?	?	Mesenteric	?
Grassberger	1897	Necropsy	73	Male	Multiple	?	Pea and walnut	Mesenteric	?
Nicholls	1899	Necropsy	65	Female	Multiple	?	Pea to walnut	Mesenteric	?
Fischer	1900	?	?	?	Single	?	Bean	?	?
Gordinier and Sampson	1905	Operation	46	Female	Multiple	False	?	Mesenteric	Intestinal obstruction.
Taylor and Larkin	1910	Necropsy	68	Female	Multiple	False	Pea to walnut	Mesenteric	Symptoms of ulcer were relieved by anterior gastro-jejunostomy.
Balfour	1913	Observed at operation for gastric ulcer	62	Male	Multiple	?	Hazel to walnut	Mesenteric	X-ray showed shadow simulating that of a perforating gastric ulcer. Died ten days after posterior gastro-jejunostomy.
Akerlund	?	Necropsy	?	?	?	?	?	?	Abdominal pain, loss of weight and "run down" condition.
Hunt and Cook	1921	Operation	54	Male	Single	?	?	?	None.
Hunt and Cook	1921	Necropsy	44	Male	Single	?	Walnut	?	None.
Helvestine	1923	Necropsy	70	Male	Multiple	?	?	Mesenteric	None.
Helvestine	1923	Necropsy	59	Female	Single	?	?	Anti-mesenteric	None.
Sheppe	1924	Necropsy	75	Male	Multiple	False	?	?	None.
Watson	1924	Operation	73	Male	Single	?	?	Mesenteric	Abdominal pains and chronic obstruction.
Baastrup	1924	X-ray and operation	?	?	?	?	?	?	None.

muscularis a sufficient cause, while Sudsiki believed diminished resistance of the connective tissue about the veins was a predisposing factor. Helvestine believes there are three factors operating conjointly in the formation of acquired diverticula: 1. Traction by mesenteric vessels or traction following adhesions. 2. Degeneration of intestinal muscularis. 3. Intra-intestinal pressure.

It is more frequently observed in individuals past the fiftieth year of life. In this series seventeen of twenty-six previously recorded ages were past fifty and of the seventeen, nine, or slightly more than fifty per cent., were found in individuals between seventy and eighty years of age. One case, that of Buchwald and Janicke, was six years old and one of Hansemann's cases was a boy of fourteen. There were nineteen males and ten females. The size varied from that of a pea to an apple. They appeared as single diverticula or multiple.

The symptoms may be acute or chronic. The acute symptoms are usually those of acute intestinal obstruction. This condition existed in the cases of Buchwald and Janicke, Gordinier and Sampson, and Terry and Mugler and in each case a diverticulum containing fecal material or an enterolith was the cause of the acute intestinal obstruction. Four of the cases presented the symptoms of chronic intestinal obstruction. They complained of loss of weight, abdominal pain, and some constipation. Three cases presented other pathological conditions, two associated with ulcers of the stomach and duodenum and one with gall-stones.

Balfour was forced to do an anterior gastro-enterostomy in a case of gastric ulcer because of adhesions between the diverticulum of the jejunum and the colon. Terry and Mugler operated on a case for duodenal ulcer and one and one-half years later operated for acute intestinal obstruction caused by an enterolith in a jejunal diverticulum. A patient, reported by J. I. Case, was operated upon for gall-stones and a large diverticulum of the jejunum confirmed, which had previously been diagnosed by X-ray examination.

But three previous cases were diagnosed before operation by means of X-ray, two by Case and the other by Baastrup.

The surgical treatment consists of the choice of three procedures, first, inversion of the sac; second, resection of the sac, and third, where the involvement is extensive, resection of the affected portion of intestine.

Conclusions.—It is evident from the analysis of the previously reported cases and our own that diverticula of the jejunum may cause symptoms acute and chronic, but that no definite symptom complex can be attributed to their presence. Also that pathology of the stomach, gall-bladder and duodenum may be associated with this condition and only by means of a careful gastro-intestinal X-ray study may it be revealed before operation.

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APPENDICITIS AND TRANSPOSITION OF THE VISCERA*

BY BYRD CHARLES WILLIS, M.D.

OF ROCKY MOUNT, N. C.

IN A series of 10,000 patients admitted to Park View Hospital previous to November 1, 1924, three were found to have total transposition of the viscera. One of these had been operated on elsewhere for acute appendicitis and had two operative scars, a right McBurney and a median. Both of the incisions were made during the same operation.

St. Clair, in 1915, stated that approximately 300 cases of complete transposition of abdominal viscera had been reported in the literature to that date. Six of these had been observed at the Mayo Clinic, and in three operation had been performed for left-sided appendicitis. Total transposition of the viscera is not found in all cases of left-sided appendicitis.

Karewski divides the causes of sinistroposition into congenital and acquired, and the causes of left-sided appendix into (1) total transposition of the viscera; (2) primary, solitary transposition of cæcum and appendix; (3) excessive length of the appendix which extends behind the bladder transversely through the pelvis, and (4) a normally located but mobile cæcum with an adhesive type of appendicitis, whereby the appendix is diverted to the left side of the body.

I have been able to find reported in the literature fifteen cases of appendicitis with complete transposition of the viscera. They are briefly summarized as follows:

CASE I.—A married woman, aged twenty-two, was operated on for chronic appendicitis through a median incision. The cæcum and appendix were found in the left iliac fossa. The appendix was removed and the patient recovered. (Christie, G. W., *Lancet*, 1916, vol. i, p. 676.)

CASE II.—A boy, aged fifteen, with transposition of the viscera, was operated on for acute appendicitis. He had had pain in the left lower abdomen. No mention was made of the site of the operation or the history of the case following operation. (Franke, F., *München. med. Wchnschr.*, 1922, vol. lxix, p. 786.)

CASE III.—A boy, aged sixteen, with transposition of the viscera, was operated on for acute appendicitis through a median incision followed by a left incision. The patient recovered. (Hebblethwaite, H., *Brit. Med. Jour.*, 1907, vol. ii, p. 1579.)

CASE IV.—A man, aged twenty-four, was operated on for abscess of the appendix on the left side. An incision was made through the left rectus, corresponding to the McBurney incision on the right. Drainage was instituted. The patient's recovery was uneventful. (Jacobson, J. H., *Am. Jour. Obst.*, 1917, vol. lxxvi, pp. 953-958.)

CASE V.—A woman, aged fifty (observed in 1883), died from perforative peritonitis, without operation. She had had severe pains on the left side. Necropsy revealed the appendix in the left hypochondrium and typical transposition of the viscera. (Landgraf.)

CASE VI.—A woman, aged twenty-five, was observed in 1918. An X-ray examination was made of her stomach and the transposition of the viscera found. Her physician was notified one and one-half years later that she had been operated on. No further

* Read before the Seaboard Medical Association, December 4, 1924.

APPENDICITIS AND TRANSPOSITION OF VISCERA

information was obtained. (Landgraf, H., *München. med. Wchnschr.*, 1922, vol. lxix, p. 513.)

CASE VII.—A patient with transposition of the viscera. The history and physical findings were typical of acute appendicitis with abscess. There was pain and tenderness and a mass on the left side. Operation was performed through an incision 4 cm. to the right of the umbilicus. (Lyle, H. H. M., *ANNALS OF SURGERY*, 1916, vol. lxiii, p. 124.)

CASE VIII.—A man, aged twenty-one, who had known since the age of fifteen that he had transposition of the viscera, was operated on for appendicitis through a left-side incision. Results

were not stated. (Mühsam, R., *Deutsch. med. Wchnschr.*, 1912, vol. i, p. 953.)

CASE IX.—A woman, aged forty-two, had pain in the left side. A diagnosis was made of the transposition of the viscera and appendicitis. No operation was performed. (Podevin and Defour, *Bull. et mem. Soc. méd. d. hôp. d. Par.*, 1913, vol. xxxv, pp. 215-217.)

CASE X.—A boy, aged fourteen, was seized suddenly with pain in the abdomen. There was general muscular rigidity with marked tenderness in both lower quad-

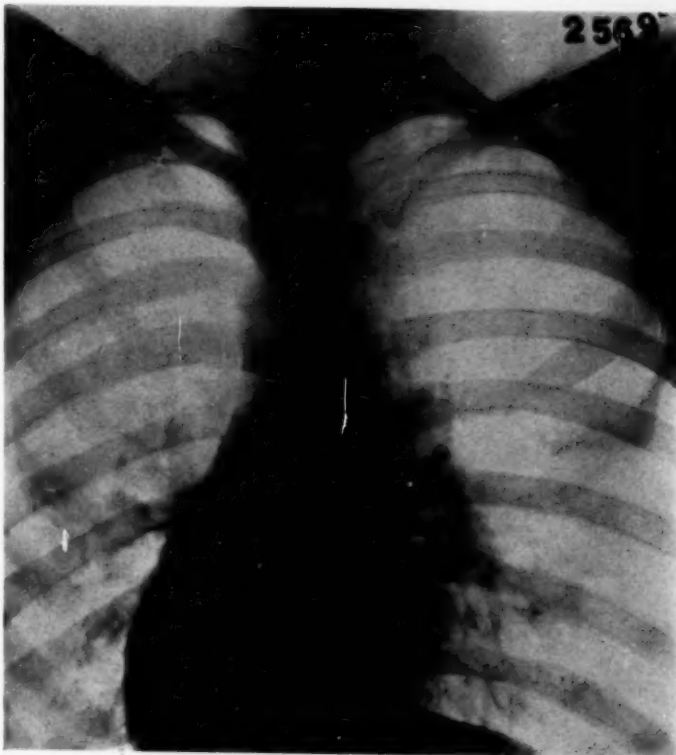


FIG. 1.—Röntgenogram of the thorax showing the dextrocardia and the general reversal of the domes of the diaphragm.

rants, more pronounced on the right than on the left. The diagnosis was made of diffuse appendiceal peritonitis, but transposition of the viscera was not suspected. Two incisions were made, one in the right lower quadrant and the other a left McBurney. The patient recovered. (Pool, E. H., *ANNALS OF SURGERY*, 1912, vol. lxi, pp. 940-942.)

CASES XI, XII and XIII.—In these three cases operations for left-sided appendicitis were performed at St. Mary's Hospital (Mayo Clinic). In two there was an acute abscess of the appendix. (St. Clair.)

CASE XIV.—A man, aged twenty-seven, suffered from nausea, general abdominal pain and vomiting. There was muscular rigidity over the lower half of the abdomen, more pronounced on the left side. The diagnosis was made of ruptured gangrenous appendix, probably with localized abscess in the left iliac fossa. Operation was performed through a right rectus incision under ether anæsthesia. The patient recovered uneventfully. (St. Clair, R., *West. Med. Times*, Denver, 1915-1916, vol. xxv, p. 322.)

CASE XV.—A married woman, aged eighteen, had pain in the middle of the abdomen with tenderness and rigidity of the left rectus. A diagnosis of acute, gangrenous appendi-

citis was made. Operation was performed through a median incision. Death occurred from general peritonitis fifteen days later. (Palamountain, W. B., *Jour. Am. Med. Assn.*, 1915, vol. lxiv, p. 1986.)

From the various sites of the incisions in these fifteen cases and the necessity in three cases of making a second incision, it would appear that the surgeons, in most of the cases, had either not appreciated that they were dealing with patients having transposition of viscera or felt uncertain of the

diagnosis. The lesion in cases in which the location was definitely stated, was found in the left iliac fossa and could have been more readily reached through a left rectus or McBurney incision, preferably the latter.



FIG. 2.—Röntgenogram of the large intestine after barium enema, showing the descending colon and sigmoid on the right side.

REPORT OF ADDITIONAL CASE.—D. C., aged nineteen, a farmer, was referred to the Park View Hospital, April 27, 1924, by Dr. W. E. Warren, and the following history obtained: In December, 1923, the patient began to have pain which started gradually

around the navel, became general, but did not extend into the epigastrium. He was not nauseated unless he took something to ease the pain. The pain usually lasted two or three hours, incapacitating him about half a day. Afterward there was soreness in the median line. He had had three or four attacks, the last one beginning two days before his admission to the hospital. He was awakened in the night by pain and nausea, and tried to vomit, but was unable to do so. The pain was severe until noon the next day, when it gradually subsided, leaving a soreness in the lower abdomen. There was no pain or tenderness in the right side. He had a chronic cough, spitting up about four ounces of thick pus each morning, which he has done since he was a child. The balance of his history had no bearing on his present illness.

Physical examination revealed the patient to be poorly nourished, anæmic, acne-scarred, with enlarged tonsils, carious teeth, pyorrhœa of gums, and foul breath. His chest was thick and expansion poor. Resonance was normal to percussion, and auscultation revealed râles over the bronchi on both sides. Fremitus was normally distributed.

APPENDICITIS AND TRANSPOSITION OF VISCERA

The heart was normal but was transposed, the apex being felt and heard at the fifth interspace at the right of the median clavicular line. There were no thrills or murmurs. The first sound was of fair quality, the second was not accentuated. The systolic blood-pressure was 100, the diastolic was not obtained as pulsation could be heard normally over the course of the vessel. The abdomen was flat, the costal angle broad, the umbilicus normal, and the walls firm. There was very little gas and no fluid. The liver, spleen, and kidneys were not palpable. There was no gurgling. There was tenderness around, and below the umbilicus, but no rigidity or mass. The erythrocytes numbered 18,000; the sputum was negative for tuberculosis bacilli; the urine was amber and clear, the specific gravity was 1.024; it contained acid, a faint trace of albumin, sugar, pus, six cells to a low-power field, and a few blood cells. Röntgenograms revealed dextrocardia with pronounced thickening around the hilus of the left lung, suggestive of tuberculosis. (Fig. 1.) X-ray examination of the bowel with a barium enema disclosed transposition of the intestine. (Fig. 2.) A diagnosis of left-sided appendicitis was made.

In view of the condition of the chest it was thought best to delay operation in the hope that operation might be performed under a local anæsthetic, as it was feared that a general anæsthetic might further complicate conditions in the chest. The patient was accordingly put on rectal tap. Nothing was given by mouth for a few days, then water and a liquid diet were allowed. May 5 the leucocytes and temperature had dropped to normal, acute symptoms had subsided, and the patient was considered ready for operation.

Morphin, $\frac{1}{4}$ grain, and atropin, 1/100 grain were given. The skin of the abdomen was cleansed with gasoline and iodine, and infiltrated with 0.5 per cent. procain at the left McBurney down through the muscles to the peritoneum. On opening the peritoneum the cæcum and appendix were readily found. The meso-appendix was infiltrated with procain and removed almost painlessly.

The appendix was about 7.5 cm. in length, and definitely thickened. The vessels were moderately corrugated, and there were some adhesions near the base. The distal half was distended to twice the size of the proximal half. The lower foot of the ileum was examined for abnormalities but none was found. The ileocaecal valve was on the inner side of the cæcum, and the appendix was in normal relation to the ileocaecal valve. The cæcum was as normally placed in the left iliac fossa as in its usual position in the right. The patient convalesced uneventfully, and left the hospital eight days after the operation.

CONCLUSIONS

1. Patients with left-sided symptoms and clinical findings suggestive of appendicitis should be carefully examined for transposition of the viscera.
2. In cases of appendicitis and transposition of the viscera the incision should be made to the left of the umbilicus.

THE "LIGATION AND DROP" TREATMENT OF THE APPENDECTOMY STUMP*

RESULTS OF 3500 CASES

By JOHN J. MALONEY, M.D.

OF CINCINNATI, OHIO

IN THE present-day discussions of intricate and ultra-scientific surgical subjects, it may not be amiss to occasionally turn our attention to some of the lesser and more common surgical procedures to see if by some slight change of technic, we might not better our results, or reduce the operative mortality rate.

In reviewing the subject of this paper, we note that a great majority of the surgical profession have marked prejudice against such procedure. We hope that this paper will at least lessen the prejudice, even though the method may not be adopted. It is always the case, that one will not change any procedure if the results are not unnecessarily bad. More so, is this the case in any surgical procedure. Many men, old in the practice of surgery, are still using methods now obsolete to some of us. We believe that these obsolete methods oftentimes are being used, not because they really are the best, but because the surgeon is not prone to give up a procedure to which he has become accustomed. Changes in surgical technic are not brought about in the measurement of years, but rather by the decades of years, so that eventually we think this method of operation shall be a universal procedure.

The ideal method of appendectomy is that method which removes all the appendix with the lowest operative mortality and the lowest morbidity rate. The essential point of any appendix operation is the treatment of the stump of the organ (Haggard¹). Operations on the appendix have varied from the inversion of the whole appendix into the lumen of the cæcum as advocated by Edebohls,² up to the resection of the stump in the cæcum and the consequent closure of the opening as an intestinal wound. This was originally taught by Deaver.

At the present time there are essentially two methods of treating the stump after an appendectomy.

(1) "The Ligation and Drop" method, leaving the stump free in the abdominal cavity.

(2) "The inversion or burying of the stump" method, whether this consists of pure inversion of the stump or covering the stump with a peritoneal cuff.

By the quotation of some statistics, we shall attempt to show the advantages of the "ligation and drop method" over the other procedure.

In a review of the literature, we have been unable to find the originator

* From service of Jos. L. DeCourcy.

TREATMENT OF THE APPENDECTOMY STUMP

of this operation, although claimed by Wyeth. This method has been universally used at Mount Sinai Hospital (New York) on thousands of cases, with never a cause for regret. (Elsberg.³)

The advantages of the "ligation and drop" method are as follows:

(1) The rapidity and ease of performance. (2) Universal adaptation to all cases. (3) Lessened percentage of fæcal fistulæ. (4) Lessened gas pains and ileus post-operatively. (5) Absolute lack of adhesions. (6) No chance for hemorrhage from the stump.

The advantages are plainly manifest. In a consecutive series of thirty-five hundred appendectomies, all these advantages have been proven. In this series of cases there have only been ten fæcal fistulæ, all in the acute cases. This more than disproves the old prejudice of some surgeons, "That to drop the stump without inversion is murder." The silk ligature used in this procedure does not slough until union has taken place. According to Lilienthal,⁴ when the stump is dropped into the peritoneal cavity adhesions form readily to its free surface, then the stump and the silk ligature slough off, leaving a perfectly clean stump. This has been amply verified in our reoperative and post-mortem findings. In reoperative cases where an appendectomy had previously been done, there have never been any adhesions, nor has the appendix scar ever been visible. The lack of post-operative adhesions lessens the morbidity rate to practically nil. In appendectomies, we never have cases of post-operative ileus (except in cases of generalized peritonitis). We attribute this to the lack of trauma to the cæcum and other operative trauma.

In another observed series of cases, done by the so-called "inversion" method, the percentage of post-operative ileus is rather high. A certain definite proportion of cases, 16 per cent., according to Monks and Blake⁵ in six hundred and fifty autopsies, have a small artery running parallel to the appendix and beneath its peritoneal coat. It is impossible to occlude this artery, except by crushing or ligating the stump. In this method of appendectomy, the artery is securely tied, and all danger of post-operative hemorrhage from this source is obviated.

Wyeth was never able to find one case of post-operative hemorrhage after the appendix stump had been tied alone with silk. Deaver,⁶ in a recent paper, reported 5 per cent. of fæcal fistulæ in acute cases of appendicitis. In our series of six hundred acute appendectomies there have only been ten fæcal fistulæ. None of these required future operation. All of these cases were operated by the simple ligation and drop method.

The fact of the proven advantages of this operation seem to us sufficient reasons for its more generalized use. The two main reasons for not using this method as advanced are:

(1) The claim that mucosa will not unite to mucosa of the appendix stump. Seelig⁷ has demonstrated the exact process. The silk ligature causes a pushing back of the mucosa when tied, so that serosa is actually brought into contact with serosa, causing firm healing.

(2) Morris, quoted by Haggard and Seelig, claims that this tight ligature causes a compression anæmia, and this allows a fertile field for bacterial growth. Seelig, to disprove this theory, tied off the appendix with silk and then cauterized the stump. The intact organs were then turned over to a bacteriologist for culture. The stumps were always sterile. Clinical experience in this series of cases has proven that the stump either must be sterile or else the peritoneal cavity is sufficiently bactericidal to destroy the few organisms present. We have never had one case where there was no pre-operative peritonitis that developed the condition post-operatively.

This is sufficient proof that the stump is thoroughly cauterized and the so-called compression anæmia is not a cause for bacterial growth.

The disadvantages of the so-called inversion of the stump method: (1) More time required for operation. (2) The method is not universally applicable. (3) There is increased trauma to the tissues. (4) An increased number of faecal fistulæ. (5) The method is unphysiological—usually. (6) More danger of hemorrhage from the stump, especially where the stump is not tied. (7) A potential infected stump is buried in a closed cavity. (8) The likelihood of inflammatory (foreign body) tumors of the cæcum.

Originally the primary purpose of the inversion method was to turn the stump into the cæcum. This was physiological and surgical. At the present time a caucus of the leading surgeons discloses the fact that Ochsner⁸ is the only one using such a method. As mentioned previously, Edebohls inverted the whole appendix into the lumen of the cæcum after tying off the meso-appendix. When asked what happened to the organ, he replied that he didn't know and didn't care.

Due to hemorrhage from the artery running parallel with the appendix, it was decided to tie the appendix and then attempt to insert the stump into the lumen of the cæcum. This was impossible, and thereby the primary purposes of the operation were defeated. (Cases of hemorrhage where the stump had not been tied are reported by Charles Mayo, Elsberg and Judd⁹). With the tying of the stump no drainage occurred into the cæcum until the ligature sloughed, if eventually it did slough. Instead of an inversion method, we have a burying method—closing in a potentially infected stump in a closed cavity, a pouch of the cæcal wall. This is absolutely unphysiological and to our mind, extremely unsurgical. The method whereby a peritoneal cuff is formed and then tied over the stump is practically the same as burying the stump in the cæcal wall. Concerning this method, Professor Riedel,¹⁰ quoted by Seelig, states: "I consider the suturing of a peritoneal cuff over the appendix stump as a very dangerous procedure. As regards going so far as to bury the infected stump into the cæcal wall, this must absolutely lead to perforation into the lumen of the cæcum. If the inverting sutures hold and adhesions are strong enough, we need not fear an intraperitoneal rupture, but need only consider the disadvantages resulting from an ulcer in the cæcum as a result of the intracæcal rupture."

TREATMENT OF THE APPENDECTOMY STUMP

Concerning the formation of foreign body tumors where inverting sutures of silk or linen have been used, we have seen the development of three such tumors about the cæcum due to such causes.

CONCLUSIONS

(1) The ligation and drop method of appendectomy is the ideal procedure because it is more easily and readily performed with lessened mortality and morbidity rate.

(2) Any method of burying the stump in the cæcal wall is unphysiological and unsurgical and is followed by a greater percentage of complications and sequelæ.

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HERNIA OF THE BLADDER*

A BRIEF REVIEW OF THE LITERATURE WITH A CASE REPORT AND A
SUGGESTION OF A POSITIVE METHOD FOR PRE-OPERATIVE DIAGNOSIS

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IN 1919 Watson¹ brought the published cases of bladder hernia up to date. Since that time a number of cases have been reported and it is our purpose, in this communication, to mention some of the recorded cases, some of the theories advanced regarding the etiology of the condition, some points regarding the pathology and treatment, to suggest a means of diagnosing the condition with certainty, and to append a report of a case treated in our own clinic.

That this type of hernia is rather rare is shown by reference to the following papers. The first report² is probably that of F. Plater, of Basle, in 1550, the second case by Jean Sala in 1620. Over one hundred years later, in 1752, Verdier reported twenty cases. Moynihan, in 1890, collected thirty-eight cases, Brunner, in 1896, one hundred and eight cases, Moynihan one hundred and twelve in 1900, and Shiel one hundred and thirty-three cases in 1908. Heineck, in 1914, in a review of the literature back to 1896, found one hundred and sixty-four cases recorded and Watson² added to this eighteen more, including two of his own in his report of 1919.

Considering the large number of inguinal and femoral herniae extant, the percentage of bladder hernia is comparatively small. Brunner and Eggenberg found this condition to exist in about 1 per cent. of eight thousand seven hundred and eighty-eight cases. The literature shows not only that bladder hernia is infrequent, but also that when it exists, surgeons usually fail to make a diagnosis before and sometimes during operation.

Etiology.—Among the causes mentioned are the following:

Prevesical Fat.—Verdier, quoted by Watson in 1752, first called attention to prevesical fat as a factor. This, acting in conjunction with other factors, either congenital or acquired, has been believed by many writers to take part in the causation of bladder hernia. In the case of inguinal hernia the traction of the fatty tissue attached to the bladder wall may draw the latter downward as the extent of the enterocele increases. Oliva³ believes that inflammation more firmly fixes the fat to the bladder and surrounding structures. Watson cautions that we should be on the lookout for bladder hernia in the recurrent types.

Sliding Hernia and Weak Abdominal Wall.—Heineck⁴ believes that

* Presented in Abstract before the Minnesota Academy of Medicine, October, 1924.

HERNIA OF THE BLADDER

bladder hernia is most often associated with the so-called sliding hernia and most writers agree that the condition is associated with congenital or acquired weakness of the abdominal wall.

Age and Sex.—Baker⁵ quotes Caley, who found that they occur most commonly in the male between fifty and sixty and in the female between thirty and forty. Oliva likewise agrees that bladder hernia is associated with old age and states that there are only sixteen cases of bladder hernia in children reported in the literature. They are uncommon before the age of forty and pregnancy is a factor that may explain the fact that they appear earlier in women. Trauma may cause a weakened abdominal wall to give way. The history in our case is suggestive of a sudden increase in intra-abdominal pressure. Changes within the bladder itself may be instrumental in helping to produce bladder hernia. Any bladder obstruction with marked distention places an additional strain upon the abdominal wall or an atonic bladder with marked flaccidity offers the chance of its wall or a diverticulum to be pushed through a hernial ring.

From the above it is evident that the etiology of bladder hernia is more or less theoretical and attempts to explain its formation are based upon the factors mentioned, *viz.*, prevesical fat, a weakened abdominal wall, either congenital (as considered the case with most inguinal herniæ) or acquired (as following the sudden change in intra-abdominal pressure), abdominal trauma, marked distention of an obstructed bladder, bladder diverticulum or flaccidity, pregnancy, obesity, old age or debilitating disease.

Pathology.—The bladder hernia may be inguinal (direct or indirect) or appear in the femoral canal. The femoral type is most frequently found in women.

Most bladder herniæ are not true herniæ in the sense that they are found in a peritoneal sac, but are false herniæ. Jaboulaz and Villard are credited with classifying them as intra-, extra- and para-peritoneal depending upon whether the bladder is within, outside or beside the peritoneum. In order of their frequency para-peritoneal comes first, then intra-peritoneal and last extra-peritoneal. Aside from the locations and types of herniæ, the pathological findings in relation to the sac, cord fat and bladder will be briefly considered.

The difficulty or impossibility of finding a true hernial sac often presents and this is easily understood when we recall the relation of the bladder to the peritoneum. If a true sac is present, it will be found that the neck of the true peritoneal pouch directs its pedicle *away* from the midline, whereas, if the sac really consists of the bladder or a bladder diverticulum, its pedicle is directed *toward* the midline. The spermatic cord usually lies to the outer side of the sac may be spread over, behind or below and external to the sac, according to Heineck. Excessive fat in the inguinal canal and the prevesical lipoma, already considered as a possible etiological factor, are considered also pathological findings of bladder hernia. The pathologic findings in the bladder itself are not constant. The bladder wall may be

thick or thin. The herniated portion may be a part of the bladder proper, as in our case, or it may be a diverticulum. According to Baker, calculi may be present in either case.

Symptoms.—The patient generally comes to the physician because he notices a bulging or "rupture" in the inguinal, or in the case of a woman, in the femoral region. This bulging may, of course, consist either of the bladder or a bladder diverticulum, excessive prevesical fat, an intestinal or omental hernia, or a combination of these. In addition hydrocele and varicocele, inflammatory glands and new growths must be kept in mind. The differential diagnosis will be considered later.

A second important symptom is the effect of urination upon the swelling. Heineck and Watson have used the term "two-step" urination in which the patient first voids the urine contained in the bladder proper and following this is able to pass the urine which has accumulated in the portion contained in the hernia. In our own case the "two-step" urination was not a prominent feature, but the patient stated that he knew that the bulging was closely related to urination, as he always found that emptying the bladder was not satisfactory unless he "lifted up and pushed in on his rupture while voiding." This brings up another important symptom, namely, that the swelling decreases in size with each urination but soon reappears.

Pain on urination may be present, but in our case this symptom did not present until shortly before the patient consulted us and was then caused by a secondary cystitis with marked frequency as well. Baker's case, however, showed severe constant pain from a purely mechanical cause as that found in any strangulation.

Diagnosis.—In arriving at a pre-operative diagnosis of bladder hernia, the history of the symptoms just mentioned is very important, as stressed by Baker, who was able to get a very definite urologic history in his case after the operation, but in view of the emergency of the case, thinking it to be the usual omental or intestinal strangulation, he neglected this before the operation. The physical findings of a bladder hernia on palpation are much like those of the usual hernia, namely, a bulging mass, but Guterbork is given credit by Watson for the point that on rectal examination the normal bulging of the distended bladder is missing in the case of a bladder hernia. We were not familiar with this point when our case was examined and it was, therefore, not noted when the prostate was palpated. In men a rectal examination should always be made to determine if there is an enlargement of the prostate giving bladder obstruction with overdistention.

The next step in making the physical examination should be taking note of the effect of urination on the size of the hernia. If it decreases in size a portion of the bladder is quite sure to be present in the sac. Otherwise, the possibility of a calculus as previously mentioned must still be considered. Another diagnostic point mentioned by Heineck that a bladder hernia, after reduction, still presents a "doughy mass," which is probably the prevesical fat. Watson states that a non-reducible hernia should suggest a bladder

HERNIA OF THE BLADDER

hernia, and as previously mentioned, a direct or recurrent hernia should also place the examiner on guard. Oliva states that, on inspection, the swelling of a bladder hernia is reddish-gray in color and that worm-like contractions of the bladder muscle should be looked for.

The mechanical tests which should be employed to establish a pre-operative diagnosis of bladder hernia are, in the most part, simple. To rule out hydrocele, it is only necessary to trans-illuminate, and if the mass is not translucent it is not a simple hydrocele. Cystic fluid can also be differentiated from urine by a diagnostic aspiration or paracentesis according to Watson. The possibility of the needle puncturing the intestine must be kept constantly in mind. As has been stated, a non-translucent mass may be a varicocele, prevesical fat, an omental or intestinal hernia, inflammatory glands or a new growth as well as bladder. A varicocele should, on palpation, give the typical circiform venous outlines and offer no particular difficulty in diagnosis. The other conditions mentioned must still be eliminated. A simple but definite means of doing this is to pass a sound, as suggested by practically all of the previously mentioned writers. If the tip of the sound is felt within the swelling, it is safe to conclude that a portion of the bladder is present in the hernia. Another simple procedure is to pass a urethral catheter. If a decrease in the size of the swelling follows the flow of urine, the bladder must participate in the formation of the hernia. Then, by injecting fluid or air, the reverse phenomena may be demonstrated. This has been suggested previously by others and was repeated in our case, although we had in mind a further refinement in diagnosis which will be discussed later. The above procedure may be followed by a cystoscopic examination, preferably under sacral anaesthesia, which completes the study of the prostate and allows an examination of the bladder for the purpose of identifying a diverticulum or pouching of the bladder wall. In our own case this was done, but a satisfactory view of the bladder was not obtained on account of the cloudiness of the urine due to the presence of a large amount of pus and sediment and the large portion of the bladder involved in the hernia. The ridge separating the bladder proper from the portion participating in the hernia had the appearance of the vesical projection of an enlarged prostate.

The X-ray in Diagnosis.—Valuable information may be obtained by means of the X-ray in conjunction with catheterization following the injection of air, iodide or bromide solutions. In our case, after the urine was removed from the bladder, air was injected and an antero-posterior X-ray view in the horizontal position established the diagnosis (Fig. 1), which was confirmed by expressing the air and injecting several ounces of sodium bromide solution, after which another cystogram was made (Fig. 2). Sgalitzer⁶ had, unknown to us, used potassium iodide (seven per cent.) with the patient sitting on the plate bending slightly backward, and in this way had shown the projection of the bladder wall into the inguinal ring. He should be given priority in the use of this method.

Complications.—The complications of bladder hernia may either call for

immediate operation or postponement of the same, depending upon the circumstances. Among the complications which may commonly present are strangulation, calculi, cystitis, or an omental or intestinal inguinal hernia. Strangulation, must be treated immediately, as in every strangulation, but a correct pre-operative diagnosis is desirable, as it may serve to prevent accidental injury to the bladder with its post-operative complications. The presence of calculi within the hernia will be discussed under treatment and usually demands that the bladder be opened and that the patient be brought into the best possible condition as in any other bladder calculus operation.

A complication not frequently mentioned is cystitis. This was found in our case and we believe that, in the absence of strangulation, the cystitis should first be alleviated by crowding fluids, lavage and antiseptic instillations before surgical repair is attempted.

Treatment.—Obviously the treatment of a bladder hernia is surgical. If complicated by an omental or intestinal hernia, the important points are to secure a competent repair of the abdominal wall, according to Bassini or one of the modifications, and to avoid, if possible, accidental opening of the bladder. An accidental urinary spill into the peritoneum should be especially guarded against and we would suggest that just before operation the bladder be emptied with a catheter, after which an air pump is attached, thus aiding the surgeon in identification of the bladder during operation and thereby preventing soiling. This method has been used by us for many years in all cystostomies, even when the invasion of the peritoneal cavity is not anticipated.

If a definite bladder diverticulum is found to be present, it should be resected according to Odasso⁷ and others and the bladder closed in layers. Opening the bladder may also be found necessary for the purpose of removing a calculus. In all such cases a drain should be used in the wound. In our case the bladder was replaced without opening it.

The question of using an in-lying catheter is not settled. Oliva, however, advocates it routinely in all cases that need bladder suture. Watson advocates bladder irrigations and instillations of argyrol every four hours in such cases. He also makes the point that the bladder should be anchored, if injured, so that possible drainage can be controlled and directed.

Prognosis.—Very few statistics are found with regard to the prognosis of bladder hernia. Watson believes that bladder trauma is the most important factor and that where bladder wounds occur the mortality is from fifteen to twenty per cent. Of course many other factors exert an influence, especially cystitis or infections elsewhere, and old age and obesity usually add to the gravity of the case.

CASE REPORT.—Mr. L., age fifty-nine, married. Consulted us May 30, 1924, complaining of the following symptoms: He had had a hernia in the left inguinal region for twenty-six years. About ten months ago this hernia apparently disappeared and gave no trouble for about nine months. Two or three weeks ago the hernia returned following a jar produced by the patient slipping upon a banana peeling. For the past six or seven days there had been a good deal of pain in the left inguinal region accompanied by frequent and burning micturition, the patient passing but a small amount of urine at a time.

HERNIA OF THE BLADDER

His family physician told him that his urine contained pus. The patient had attempted to retain the hernia by means of a truss but had been unsuccessful. His general health had been good, but he was inclined to obesity—weight about two hundred pounds. His physical examination was negative, excepting for some gingivitis and decayed teeth, blood-pressure 140/80, some tenderness in the right upper quadrant and an indefinite history of chronic indigestion. Examination of the lower abdomen, which was pendulous, showed what appeared to be a left oblique inguinal scrotal hernia, the protruding mass being approximately the size of an orange. The mass fluctuated and disappeared when

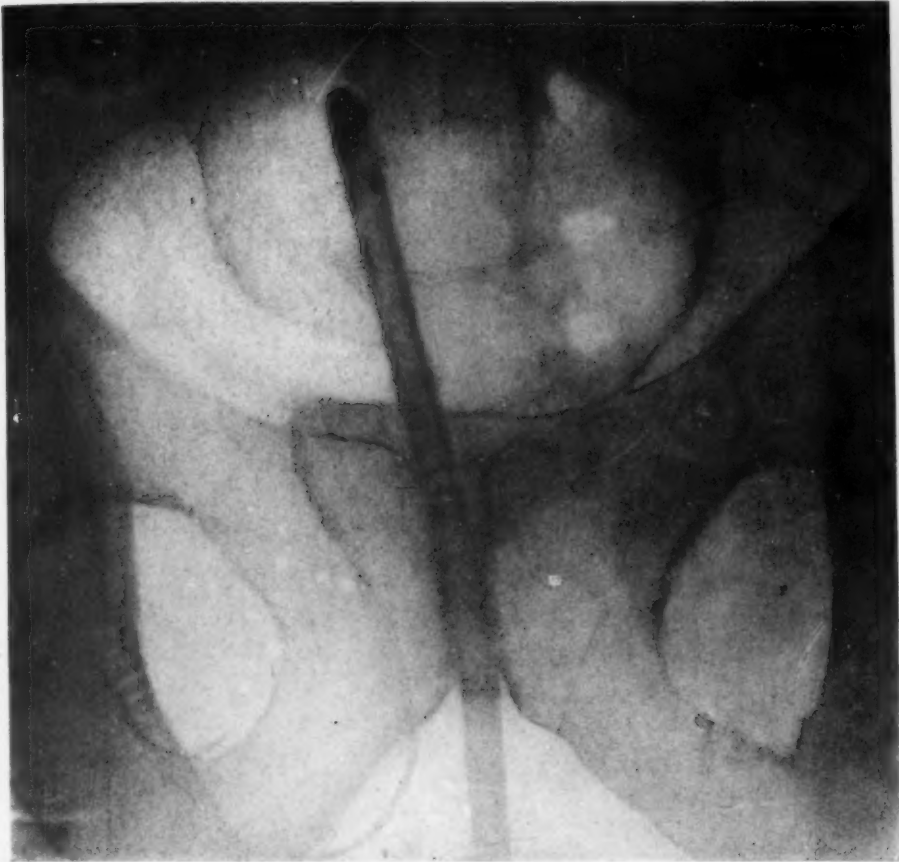


FIG. 1.—Hernia of the bladder. Pneumocystogram showing bladder dilated with air and about one-third of its wall occupying the inguinal canal.

the patient assumed the recumbent position, the hernia ring easily admitting three fingers. Manipulation of the hernial contents caused vesical tenesmus. The urine showed a specific gravity of 1020, a fair trace of albumen, a few red and many pus cells. Two days later, June 1, the patient entered St. Mary's Hospital for investigation. On June 2, he was asked to empty the bladder as completely as possible, and then the following investigation was made after introducing 70 c.c. of 1 per cent. novocain-adrenalin solution into the sacral canal. A soft rubber catheter was introduced through the urethra and 75 c.c. of cloudy residual urine was withdrawn. No change was noted in the appearance of the hernia as the distended hernial sac had disappeared with the patient in the recumbent position, as noted above. The bladder was then distended with air and the reappearance of the hernia was noted, although its dimensions were not as great as when the patient was

standing. A pneumocystogram was then made with the patient in the vertical position (Fig. 1). This conclusively demonstrated that a large part of the bladder participated in the scrotal portion of the hernia. The air was then replaced by a 15 per cent. solution of sodium bromide and the cystogram (Fig. 2) was made. The cystoscope was then introduced and the presence of an acute cystitis ascertained. The ridge separating the

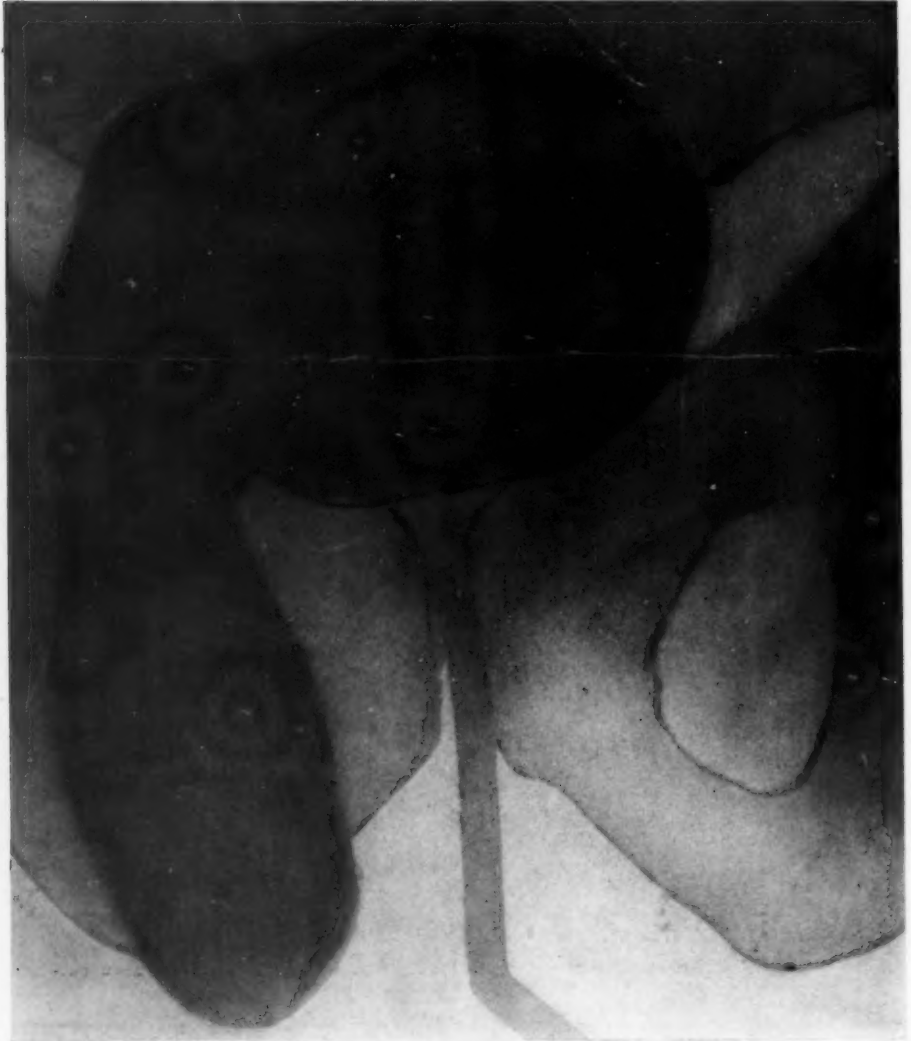


FIG. 2.—Hernia of the bladder. Radiogram showing bladder filled with 15 per cent. sodium bromide solution. About one-third of the bladder occupies the inguinal canal.

herniated portion from the remainder of the bladder had the appearance of the projecting lobe of a large prostate. Following this the cystitis was treated with irrigations of boracic acid solution and instillations of mercurochrome until practically all urinary symptoms had abated. After leaving the hospital on account of the demands of business, the patient developed an acute bronchitis, followed by an attack of acute cholecystitis, complicated by jaundice, for which he entered the hospital on July 3. His gall-bladder condition rapidly cleared up and on July 17, after his condition had returned to normal,

HERNIA OF THE BLADDER

the hernia operation was performed. Under local anæsthesia the hernial sac was exposed and opened immediately after identification of the veins and vas. The exposure of the peritoneal surface of the bladder, combined with the information gained before the operation, contributed greatly to the facility with which the herniated portion of the bladder was dissected from its scrotal bed. With the patient in the Trendelenberg position and tilted to the right, a negative intra-abdominal pressure obtained, and the peritoneal sac, which was voluminous, was found to obtain no attached viscera. The



FIG. 3.—Hernia of the bladder. After operation. Bladder partially distended with 15 per cent. sodium bromide solution. Showing that organ has assumed its normal contour.

sac was excised and closed in the usual manner. A large mass of varicose veins excised and the fascial planes united after the method of Bassini and Andrews, using chromic gut. The herniated portion of the bladder after its release gravitated into its normal position in the pelvis. The laxity of the abdominal wall and the absence of red muscular tissue allowed ample opportunity for broad overlapping of the fascial planes. Special precautions were taken to unite the tissues near the mesial line. The patient made an uninterrupted recovery, has had no return of his bladder symptoms, and the cystogram (Fig. 3) shows that the bladder returned to its normal position and assumed its natural contour, thus proving quite satisfactorily that, in this case, we were not dealing with a bladder diverticulum. Although this patient's abdomen was fat, there was a comparatively small amount of fat present in the hernial mass. These factors quite effectually

FARR AND BRUNKOW

eliminate prevesical fat, bladder diverticulum and sliding hernia from the etiology of this case. Our impression is that relaxation of the abdominal wall or a possible congenital deformity, or both, are to be considered among the most important etiological factors.

CONCLUSIONS

In all inguinal and femoral herniæ, especially in people past middle life, the possibility of the involvement of the bladder should be kept in mind.

In any case a positive diagnosis can be made by means of the X-ray as outlined above.

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GRANULOMA INGUINALE

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History.—Granuloma inguinale as a clinical entity was first described by Conyers and Daniels in 1896. A few years previously, 1882, McLeod, of India, described a serpiginous ulceration of the groin. In our country, it was described by Guindon in 1912. During the last five years there have been not infrequent reports of cases of ulcerating granuloma of the pudenda. Driver, in 1923, reported eight cases out of 485 genital lesions over a period of two years. The disease is now apparently more endemic than sporadic, especially in the negro race, unless it is merely that our diagnostic ability is becoming greater.

Etiology.
—The bacterial agent most commonly accepted as the etiological factor is the small



FIG. 1.—Lesion before treatment.

rod or coccus-like body of *Donovans* which lies singly or in groups in mononuclear cells obtained by scraping the sore. It takes the ordinary stains such as Gram's but the Giemsa stain is necessary to demonstrate the capsule. This organism has not been found in all cases. However, it was found in this case. Some writers believe its presence merely a secondary characteristic and not a cause. Wise advanced the theory of a spirochætal origin, but it seems to have lost favor. Syphilis as a cause has definitely been ruled out.

Pathology.—For the histopathology the writer refers to the studies of Conyers and Daniels, Galloway, Claassen, or Goodman. In general, there is a marked round-cell infiltration, increased vascularity, tissue destruction with no tendency to caseation, suppuration or giant-cell formation.

Diagnosis.—Granuloma inguinale usually begins as a papule which soon undergoes ulcerative changes, resulting in a sharply outlined, shiny-red granular ulceration, serpiginous in character and bleeding easily. Cicatrizing islands form within the mass of granulation tissue but soon break down, due to the development of new nodules. The disease spreads by auto-inoculation and

peripheral extension, the secretions usually following the dependent skin folds toward the anus and laterally along the gluteal folds. In its upward extension it follows the inguinal fold. The absence of adenopathy seems to be a striking characteristic. However, there is frequently considerable blocking of lymph channels, leading to a pseudo-elephantiasis of penis or vulva. The surrounding induration of the ulcer is rather superficial in character and of soft cartilaginous consistency. The patient complains more of burning and itching rather than of sharp pain. The general condition of this patient even over a period of eight years does not seem to have become cachectic. The extending ulceration with resulting cicatrization may lead to stricture of the anus, rectum, urethra, or vagina. In a condition similar to the fore-

going, especially if there is a history of chronicity and a failure to respond to anti-luetic or other ordinary methods of treatment, granuloma inguinale should be strongly suspected.

*Differential
Diagnosis.*
—Ulcerating
lesions of the



FIG. 2.—Lesion after treatment with tartar emetic. Entirely healed.

puddenda are usually first considered as luetic. From chancre, it is differentiated by its definite sclerosed border and friable granulating cicatrizing base. The chancre, although indurated, is sharply punched out and has a rather flat base. History of chronicity and lack of adenopathy also favor ulcerating granuloma.

From condyloma lata, it is differentiated by its granular appearance, color, and ulceration. From gumma it is differentiated by the slow advance, superficial character, and vascularity. At times serology or failure to respond to treatment may help in the diagnosis.

In chancroid, there is an acute inflammation with painful inguinal adenopathy and no sclerosing border.

From tuberculosis, by the organism of Koch, tuberculin reaction, animal inoculation, and other signs of tuberculosis.

Epithelioma and carcinoma are common diagnoses for ulcerating granuloma (such as this case) and superficially it does resemble it with the indurating edges and friable granulating base. The presence of an ulceration with scales or crusts and the histological picture would differentiate the two con-

GRANULOMA INGUINALE

ditions. Clinically the history, age of patient, absence of glandular enlargement, metastasis, cachexia and effect of treatment would exclude malignant disease.

Esthiomene (Graves) is distinguished by the extreme inflammation, and ulcerating of the vulva with superficial sloughing and purulent discharge.

Treatment.—This type of lesion from the reports of previous writers and from the behavior of this case, does not respond to ordinary antiseptics, anti-syphilitic treatment, surgery, X-ray or radium. In 1906, Mensil and Nicolle first introduced antimony and potassium salts in treatment of diseases of protozoal origin. In 1913, Aragoo and Vianna in Brazil were the first to treat granuloma inguinale with these salts. This drug is apparently selective and in the great majority of cases rapid healing takes place. The best results are obtained by intravenous treatments, the drug being obtained in ampules of 1 per cent. solution. In this case 1 c.c. of a 1 per cent. solution was diluted with 5 c.c. of sterile distilled water, treatments being given every three or four days and dosage increased by 1 c.c. until 5 c.c. diluted with 5 c.c. sterile distilled water was being given at one dose. Within one week there was improvement and at the end of four weeks the lesion was entirely healed. The local treatment may be limited to a wash. A urinary antiseptic by mouth, because of an accompanying genito-urinary infection especially in females, is probably advisable.

CASE REPORT.—S. I., negress, age thirty-six, married, first at fourteen, divorced, married and divorced again, never lived south of Kansas border, both husbands from Oklahoma. Eight years ago, in 1916, a small ulcer appeared on the vulva. A diagnosis of a syphilitic infection was made by her family doctor, and under treatment the lesion became worse. Failing to respond to treatment, a diagnosis of cancer was made. She was given douches and an ointment and failing to find relief changed doctors. Again it was diagnosed as syphilis and failing to respond to treatment was again called cancer. She was told that an operation would be futile and was given narcotics ad-lib and a local wash. In 1920, with the lesion gradually progressing, she went to another doctor who advised X-ray and radium treatment. At this time she was in the hospital for five months. She was then sent to the hospital again where the labia minora were removed because of pain and swelling and a few glands removed from the left inguinal region. At this time, she developed a sore on the left thigh and was told that she was absolutely incurable and again discharged with narcotics ad-lib. She then began losing weight and appetite and was practically bedridden. In November, 1924, she came under my observation eight years after onset. There was extensive ulcerating granuloma of the perineum with islands of cicatricial tissue (Fig. 1). The ulceration had invaded the vagina and rectum and vaginal examination revealed a soft cartilaginous induration throughout the perineum. It did not have the consistency of cancer nor was there the invasion and adenopathy that goes with it. The labia minora were absent. There was a similar ulcer, the size of a silver dollar, on the left thigh. The general condition was only fair, some loss of weight. The Wassermann reaction was negative.

The lesion was kept clean with weak boric acid solution for several days and then after omitting the wash one day, smears were taken. From five smears, only one slide showed a few mononuclear cells with intracellular coccus-like bodies. No capsule was demonstrated. Treatment, as outlined above, was then instituted.

Progress.—Within one week there was improvement and at the end of four weeks the lesion was entirely healed.

Summary.—Summarizing, we may say: 1. The disease is not rare in the temperate zone. 2. The intravenous administration of tartar emetic constitutes a specific form of treatment in a large majority of cases.

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CYSTS OF THE ILIO-PSOAS BURSA

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THE ilio-psoas bursa is situated beneath the musculo-tendinous portion of the ilio-psoas muscle, where it bends over the edge of the pelvis and the capsule of the hip-joint. It is said to be the largest synovial bursa normally present in the body. Its anatomical relations have been carefully studied by Durville, Lund, and others, though these writers differ somewhat as to its extent. Durville states that its upper limit is not above Poupart's ligament, whereas Lund states that, in a great number of cases, it extends upwards into the iliac fossa. Both writers are agreed that its inferior border is in the neighborhood of the lesser trochanter of the femur, and that its lateral extent is approximately from the ileo-pectineal eminence medially to the anterior inferior spine of the ileum, laterally.

The portion of the capsule of the hip-joint lying between the ilio-femoral ligament (Y ligament) and the pubo-capsular ligament is very thin. At this spot the bursa is in almost immediate relation with the synovial membrane of the hip-joint. In some cases the membrane separating them is imperfect and a communication is established between the bursa and the hip-joint. It would seem that such communication is not unusual, particularly in the adult of middle age or past. Perhaps as stated by Durville, trauma and friction tends to establish the communication.

Cysts, as well as inflammatory conditions of the ilio-psoas bursa, are probably of more common occurrence than the rather infrequent reports of them in the literature would seem to indicate. We have been able to find reports by only two American writers, Lund and Cullen. As far as we are able to determine, Joly first described cystic lesions of this bursa in 1847. Durville writing in 1895 published the first comprehensive article. This paper, together with the work of Zuelzer, are the classical papers on the subject. We have been able to collect 32 cases from the literature; of these 9 were inflammatory (including tuberculous) lesions, and 23 were simple cystic tumors.

The purpose of this paper is to add a new case to the literature and to summarize the clinical data on affections of the ilio-psoas bursa.

Clinical History.—Mrs. W. H. S. was referred by Dr. Leslie Lingeman, of Noblesville, Indiana, for a tumor of the right groin.

The patient was sixty years of age, and had never been of rugged health. Her father, a brother, and a sister had died of tuberculosis. For the past six or seven years

* Read before the Western Surgical Association, December, 1924.

she had complained of aching pains in her limbs (including the hip-joint) and back. She also has had occasional spells of numbness and weakness in the legs which have caused her to fall to the floor.

She had noticed the tumor of the groin for the first time two months before the examination. There had been an entire absence of pain, disability or discomfort traceable to the tumor.

The patient was a tall, thin, rather anæmic-appearing woman. A general physical examination revealed nothing of importance. Temperature, normal. Blood-pressure, 180/90. Complement fixations for syphilis and tuberculosis were negative.

In the right groin was an ovoid tumor about the size of a hen's egg directly below the middle of Poupart's ligament, its long axis parallel to the ligament. It had a definite edge. Its contour was smooth and regular. The skin over it was unchanged in appearance. Over the internal aspect of the tumor could be seen the femoral artery, which was pushed forward by the mass. No fluctuation could be detected. The tumor did not change in shape or position on any movement of the thigh, and apparently was firmly attached to the deep structures. There was no enlargement of the inguinal glands, and no detectable interference in the circulation of the leg. Deep palpation above Poupart's ligament revealed nothing abnormal. The patient walked without pain or limp. There was no bulging on coughing or straining. There was no pulsation. The hip-joint seemed normal in every respect. Examination of the spine was negative, as was pelvic examination. There was no evidence of bone disease in either the pelvic bones or vertebrae. Psoas abscess could certainly be excluded, likewise hernia, aneurism, or enlargement of lymphatic glands. The hip-joint was apparently normal. The tumor was regarded as probably neoplastic, though its smooth contour and the lack of attachment to the skin or interference with the circulation of the limb made it seem likely that the tumor was not malignant.

In light of our present knowledge, a probable diagnosis of cyst of the ilio-psoas bursa should certainly have been made.

Operation.—A skin incision was made below and parallel to Poupart's ligament directly over the most prominent part of the tumor. The fascia lata was easily stripped from the mass. The anterior crural nerve was carefully isolated and retracted medially. On clearing the surface of the tumor of overlying fat and areolar tissue, fluctuation was detectable. It was then perfectly evident that we were dealing with a cyst. It was aspirated and about 40 c.c. of a gelatinous material of about the consistency of thin apple jelly was withdrawn. The cyst was now opened and the remainder of its contents evacuated. The wall was tough and fibrous with an inner surface smooth and mucoid. The inner surface and contents were similar in every respect to those of ordinary ganglion.

The cyst wall was completely excised. It was found to be attached on its posterior surface over an area the size of a nickel to the pubic bone and capsule of the hip-joint. In freeing the wall, a secondary very small cyst, more deeply placed beneath the ilio-psoas tendon, was opened. Although the cysts did not communicate one with another, it was noted that there was a funnel-like dimple at the very bottom of the larger cyst, extending towards the smaller, which gave the idea that they might at one time have communicated.

The wound was closed in layers and without drainage. The patient made an uneventful recovery.

Microscopically the cyst wall was demonstrated to consist of a dense hyalinized fibrous tissue in which were sparse areas of round-cell infiltration. The free edge exhibited a condensation of fibrous tissue but no demonstrable lining mesothelium.

General Discussion.—We can find in the literature but two other cases of cyst of the ilio-psoas bursa in women, those of Heineke and Pisano. The other 21 cases all occurred in men.

CYSTS OF THE ILIO-PSOAS BURSA

For all practical purposes we may divide enlargements of the ilio-psoas bursa on the basis of etiology into four classes: (1) pyogenic; (2) tuberculous; (3) syphilitic; and (4) simple chronic bursitis or cystic tumor.

Although this paper is concerned with the fourth type, it is not amiss to mention briefly the first three types.

Pyogenic affections of the bursa are either primary in the bursa or secondary to affections of the hip-joint. Gonorrhœal and typhoid bursitis, as well as bursitis due to the ordinary pyogenic organisms, have been reported. The findings are the general and local symptoms of a pyogenic infection. The local swelling in the groin is an extremely tender fluctuant mass with all the classical findings of acute inflammation. Movement at the joint is extremely painful. Not infrequently there may be circulatory disturbances arising from the close proximity of the femoral vein to the inflamed bursa. Thrombosis of the vein has been described. Even in those cases where there is no communication between the bursa and the joint cavity, there is but a thin sheet of tissue between them, so that a pyogenic infection of the one is likely to involve the other. For this reason ilio-psoas bursitis demands prompt surgical attention.

Tuberculosis of the bursa may likewise be primary in the bursa or secondary to disease of the hip. As in tuberculous bursitis elsewhere, it may be either caseous in form or of the "rice-body" type.

Churchman, in a very complete and exhaustive article, has reviewed the subject of syphilitic disease of synovial bursæ. He tabulated 28 cases, none of them, however, of the ilio-psoas bursa. The syphilitic bursitis may take the form of a simple hygroma (this type is particularly seen in the secondary stage), or it may be of either a gummatous, ulcerative, or fungous form in the tertiary stage. The content of the simple hygroma form he describes as being "a yellowish, viscid, cloudy, coagulable fluid." This description applies to the type of material seen in the ordinary simple cyst of the ilio-psoas bursa.

Characteristics of syphilitic bursitis, he points out, are: (1) Previous history, or evidences of syphilis. (2) Slow and chronic course. (3) Absence of much pain or functional disability. (4) Symmetry of the involvement. (5) Efficiency of specific therapy.

Perhaps some of the so-called cases of simple cystic bursitis of unknown origin are syphilitic in nature.

The fourth condition, namely cystic tumor of the bursa, to which our case belongs, seems to be largely of traumatic origin. Many of the collected cases have a definite history of trauma. It is further to be noted that the condition is usually seen in men who are accustomed to doing heavy labor. However as pointed out by Durville, the exact relation between trauma and the condition is not so directly traced as in the chronic bursitis of the superficial bursæ, as for example, in housemaid's knee. It is conceivable that the constant friction from the overlying tendon traumatizes the bursa and leads to a simple synovitis with an excessive formation of synovial fluid. This leads to distention of the bursa which may extend in various directions.

Rheumatism (not acute) involving the hip-joint seems to be the other big etiological factor. In this group of cases, in which the disease of the hip-joint seems to be primary, seemingly without exception there exists (or has existed) a communication between the bursa and the hip-joint. Perhaps as W. Morratt Baker describes as occurring in the knee, the increased intra-articular pressure promotes the formation of diverticuli of the synovial sac of the joint, and tends to produce a communication between the joint cavity and the bursa even if such has not previously existed.

A slow insidious onset with vague pain and some functional disturbance is the usual history of simple cystic tumor of the ilio-psoas bursa. Occasionally, however, the presence of the tumor mass is the presenting and only symptom. At the onset the pain is usually of a vague and not very distressing character, and is more or less inconstant. It may be limited to the region of the thigh immediately below the inguinal ligament, or may irradiate down the medial surface of the thigh and into the knee. Pain in the knee-joint is not at all unusual. Apart from those cases in which the disease of the hip-joint is primary and the involvement of the bursa is secondary (in which the disturbed function is really due to the diseased hip), the functional disturbance at the onset is usually slight. It may consist of a subconscious limp. Occasionally it may be noted that there is a slight tendency to keep the limb in a position of slight flexion and outward rotation.

Sometimes it is a matter of years after the initial symptoms before the tumor mass appears. With the appearance of the tumor mass the symptoms previously noted usually become exaggerated. The pain is likely to be more severe. Functional disturbance is likely to be increased. Occasionally walking is seriously hampered. Durville mentions a feeling of weakness and uselessness of the limb.

Zuelzer and others have found that the typical attitude of the limb in these cases is one of slight flexion, abduction, and outward rotation. Pain is likely to be increased by the opposite movements.

Usually there is but little interference with mobility at the hip except that incurred by the presence of the tumor mass. Adduction and rotation may be somewhat limited.

The tumor mass is nearly without exception first noted in the upper part of Scarpa's triangle, immediately below the inguinal ligament at about its midpoint. Usually its long axis is more or less parallel to the tendon of the psoas, but it is frequently parallel to Poupart's ligament. It may or may not be fluctuant. Very often fluctuation is absent when the limb is extended, and detectable when it is flexed, as pointed out by Durville. Sometimes it is unobtainable in either flexion or extension as in our case. Occasionally as noted by Durville, the tumor is reducible either from its connection with the articular cavity or in the multilocular type of tumor with other more deeply placed loculi.

Rarely as in the case of Kummer, there is interference with the circulation of the limb from pressure on the femoral vein.

CYSTS OF THE ILIO-PSOAS BURSA

Durville points out that the pain arising from the tumor is readily explained by the intimate relation of the anterior crural nerve to the tumor mass.

The tumor increases in size slowly and may reach the size of an infant's head. With the increased size, the mass may extend in various directions. Frequently it extends upwards into the iliac fossa, and it may, as in Cullen's occupy nearly one-half of the pelvis. In Charleston's case the tumor extended down to the knee. Cases have been recorded in which the mass extended posteriorly and presented at the lower margin of the gluteal fold. Occasionally the tumor is multilocular. In Schaeffer's case there were two presenting tumor masses, one in the groin, and the other at the edge of the gluteus maximus. In this case the fluid might be forced from one into the other by digital pressure. Such extreme cases are rare, however, and more usually the projecting tumor mass is single, more or less ovoid in shape, rather sharply outlined, and the size of a hen's egg or slightly larger.

The contents of the cyst is a thick viscous fluid, of high specific gravity, and citrin yellow in color. Occasionally detached cartilaginous bodies have been found in the contents as reported by Cullen and Delbet.

It bears reiteration that the tumor mass may be the only symptom, there being no pain or interference with mobility.

Treatment.—All writers on this subject are in agreement that the only satisfactory treatment is excision of the cyst. In the present case this was easily accomplished by an incision parallel and just below Poupart's ligament. Lund advises a vertical skin incision with separation of the anterior crural nerve from the femoral artery, and an opening into the cyst by pulling apart the fibres of the ilio-psoas muscle. The approach of course will have to be modified to meet specific conditions.

Collected Cases of Cystic Tumor of the Ilio-psoas Bursa.—(Not demonstratedly tuberculous or pyogenic.) Including the collected cases of Zuelzer and Durville.

CASE I.—VELPEAU in the thesis of Joly. In this case all reducible tumors had been eliminated in the differential diagnosis except cold abscess, an involvement of the articulation, and abscess of the sub-psoas bursa. The good condition of the patient removed the first possibility. The absence of evident affection of the joint, together with the position and general characteristics led to the right diagnosis. Simple puncture was done. The tumor disappeared only to appear again.

CASE II.—CHASSAIGNAC. The patient, a laborer, complained of pain in the lumbar region and thigh which would disappear only to return again at irregular intervals. After four or five months a non-fluctuant tumor about the size of a hen's egg appeared underneath Poupart's ligament, between the anterior superior iliac spine and the inferior opening of the inguinal canal. On puncture a limpid yellow fluid resembling synovial fluid was withdrawn. The tumor immediately filled up again. The case was cured by the injection of equal parts water and iodine.

CASE III.—NATALIS GUILLOT in Maisonneuve. A man, seventy years of age, who had used crutches for twenty years. Movement at the hip was possible and even easy. The limb was shortened 4 cm. In the inguinal regional was a prominent tumor mass

lying behind the femoral artery, extending inferiorly about 3 cm. below Poupart's ligament, and superiorly for a distance not clearly delimited.

At autopsy (the man died of pneumonia) great destruction of the hip was exposed. The head and neck of the femur were destroyed, and the cavity of the acetabulum was filled up with bony tissue. The joint cavity communicated in the region of the lesser trochanter by a small canal with a cystic tumor which was located behind the ilio-psoas and extended upwards into the pelvis for 4 or 5 cm. The capsule of the tumor was composed of dense fibrous tissue. The tumor and the joint cavity were filled with a thick yellow viscous fluid.

CASE IV.—HEINEKE. Young woman, thirty-four years of age, had had for many years a rheumatic involvement of the hip-joint. Examination revealed a fluctuating tumor extending below Poupart's ligament down along the psoas muscle and pushing forwards the femoral vessels. The size of the tumor was decreased on pressure, only to be regained on release of the pressure. Passive motion of the hip was free and without pain. Active motion was limited and weak.

CASE V.—WERNER in Volkmann. The patient was a young man who developed a tumor extending from the lesser trochanter up beneath Poupart's ligament into the pelvis. It contained two litres of clear synovial fluid. The tumor was without any evidences of inflammation.

(It is questionable whether this case should be in this group.)

CASE VI.—CHARLESTON. Charleston describes in a negro, fifty years of age, a cystic tumor in the superior and medial aspect of the thigh extending from Poupart's ligament downwards to the region of the knee-joint. It was determined at operation that there was a prolongation upwards into the pelvis.

CASE VII.—SCHAEFFER. A man, aged forty, presented a tumor the size of an infant's head on the anterior aspect of the thigh just beneath Poupart's ligament. Two years previously he had injured the anterior aspect of the thigh in a fall. A year and a half after the injury, he began to complain of pain and slight functional disturbance in the thigh and hip. The tumor had rapidly become larger. Its shape was oval with its long axis following the direction of the tendon of the psoas. The limb was in a position of flexion and any attempt to extend it aggravated the pain. Fluctuation was obtainable when the limb was flexed, but absent when it was extended.

There was a second tumor of like characteristics located at the edge of the gluteus maximus. On pressure the posterior tumor could be made to disappear coincident with which it could be noted that the anterior increased in size. Evidently the tumors communicated with one another.

The fluid contained in the cysts was a thick, viscous, yellow fluid. It was demonstrated that the anterior cyst communicated with the cavity of the hip-joint.

CASE VIII.—PAGET (also Baker). The patient, a house decorator, was healthy except for rheumatism. For three years he had been bothered with pain in his left hip and knee. The affection had become progressively worse so that when first examined his hip was immovable. It was recorded at this time that there was a slight fulness below Poupart's ligament. Under treatment he was so improved as to be able to get out and do his work for six years. At the end of this time he returned with marked impairment of movement of the left knee and hip. The limb was three-quarters of an inch shortened and everted. The whole of Scarpa's triangle from Poupart's ligament to the middle of the thigh was occupied by a large hemispherical cyst of an approximate diameter of 18 cm. On tapping 42 ounces of yellow fluid were withdrawn. At a later date 40 ounces were withdrawn.

CASE IX.—PRENGRUEBER (Perier's case). The patient, a man of fifty-four years, had gradually noticed the development of a tumor in the inguinal region. There was some interference in movement. Pain was presented along the course of the anterior crural nerve. The tumor occupied the superior and external portion of Scarpa's triangle behind the psoas muscle, and was definitely prolonged up under the inguinal ligament.

CYSTS OF THE ILIO-PSOAS BURSA

It was sharply circumscribed and both its intra- and extra-pelvic portions were easily outlined. In consistency it was hard, and gave the idea of fluid under great pressure. Anterior to the tumor on its medial aspect could be felt the pulsating femoral artery. The content of the tumor was the typical yellowish viscous fluid of such tumors.

CASE X.—SPRENGEL. A man, age fifty-one, had been suffering for a year from pain in the right knee. For the last five months he had noticed a swelling in the inguinal region, together with a feeling of weakness in the right leg. The patient limped markedly, but his pain was insignificant. The tumor was ovoid in shape, and located in the superior part of the thigh anterior to the hip-joint. It extended upwards beneath Poupart's ligament a little way into the pelvis, downwards for a distance of 6 cm. below Poupart's ligament, medially as far as the junction of the medial third with the outer two-thirds of the ligament, and laterally as far as the anterior superior spine of the ileum. Fluctuation was present. There was no limitation of movement at the hip except that induced by the presence of the tumor mass. At operation one-third of a litre of thick yellow fluid was withdrawn. The sack had extensive communication with the hip-joint.

CASE XI.—DAGRON (Le Dentu's case). A man, aged sixty, had had a right inguinal hernia for two years. He noticed some vague pains in the right inguinal region, coincident with which was the development of a tumor (other than the hernia) the size of a walnut. The tumor was oval in shape, with the great axis corresponding to the fold of the thigh. It measured 8 x 5 cm. The beating of the femoral artery could be felt over the medial part of the tumor. Fluctuation was easily obtained. Movements of the hip were not painful. On aspiration 250 grams of thick, transparent, yellow fluid, rich in albumin, was obtained. At a later date an equal amount of the same sort of fluid was withdrawn. At operation no opening between the cyst and the joint cavity was seen. The patient died of purulent infection. At autopsy a connection between the two cavities was demonstrated.

CASE XII.—HOFFA. A man, complained of pain in the region of the right hip and even extending down to the knee. A year previously he had injured the limb, but it had given him no trouble until this time. On examination the limb was seen to assume a position of partial flexion, with slight abduction and lateral rotation. Movement at the thigh in the opposite of these directions, *i.e.*, adduction, flexion, and medial rotation, was limited and painful. A tumor mass in the upper part of the thigh underneath Poupart's ligament was easily demonstrable.

CASE XIII.—SONNEBORN. A man, forty-six years of age, had been treated for a year for a rheumatic affection of the hip. There was no history of traumatism. Standing and walking were impossible. No signs of coxalgia. On the anterior aspect of the hip, in the neighborhood of the articular capsule, was a slight swelling, painful, and questionably fluctuant. Under the local treatment the tumor disappeared.

CASE XIV.—HERDTMANN. The patient had had his left leg crushed between two cars. A painful swelling of the ilio-*ps*oas bursa developed. Flexion or medial rotation caused a great deal of pain.

CASE XV.—MOMMSEN. The patient had a painless tumor projecting from the region of the ilio-*ps*oas beneath Poupart's ligament. The femoral artery was carried forward by the mass. The tumor was fluctuant and on pressure decreased in size.

CASE XVI.—MOMMSEN. A man, aged fifty, complained of difficulty in walking due to a swelling in the right inguinal region. It had increased in size until it was as large as two fists. It was firm in consistency, non-fluctuant, and but slightly movable. Pre-operative diagnosis was sarcoma of the fascia of the hip. At operation its true nature was determined.

CASE XVII.—COUTEAUD. A man, thirty-one years of age, had acquired syphilis six years previously. On the inner side of the thigh was a regularly outlined tumor mass, the size of an egg. Fluctuation could be obtained, and it was determined that

GATCH AND GREEN

the fluctuant mass extended up into the pelvis. The hip-joint was normal. Puncture revealed that the contained fluid was of a clear yellow viscous nature.

CASE XVIII.—DE WECK and DUPREZ. A man, thirty-seven years of age, twenty-six years ago had suffered a fracture of the femur near its superior extremity. On healing the limb was shortened by two centimetres, and a certain amount of diffuse tumefaction persisted in the region of the groin. Four or five months previous to operation this tumefaction became painful and its volume decreased. On puncture a limpid, syrup-like liquid, very rich in albumin, was withdrawn. At a later date on reappearance of the tumor it was exposed and excised. It was about the size of an egg and fluctuant. The fluid contained was similar to synovial fluid. In addition to the fluid there were two whitish-yellow bodies composed of fibrous tissue, cartilage and bone contained within the sack. The tumor was in the position of the ilio-psoas bursa.

CASE XIX.—DELBET describes the presence of three foreign bodies, each having the volume of a large nut, in a hygroma of the psoas bursa. They were not detectable previous to operation. The bodies had the appearance and structure of articulated foreign bodies, but the hygroma did not communicate with the joint cavity.

CASE XX.—PISANO. A woman, sixty-two years of age, had for two months been bothered with cramp-like pain in the left thigh, particularly on the posterior aspect, and in the hip-joint. About a month later she had noticed a swelling in the left inguinal region. Examination revealed a fluctuant, non-expansile tumor, in the upper part of Scarpa's triangle the size of the head of a full-term fœtus. Thigh slightly flexed. Active and passive movement painful. Operation under local anæsthesia disclosed the cystic tumor beneath the psoas and pectineal muscles, extending upwards for a considerable distance into the iliac fossa. The cyst wall was fibrous and contained about 400 c.c. of lemon-colored, slightly viscous fluid. On the inner surface of the sac there were several places where an endothelial lining was microscopically visible.

CASE XXI.—CULLEN. A man, aged forty-six, had had a limp for ten years. He had been told that he had a tumor of the left hip. His left leg was stiff, and in walking the left hip-joint was held as immobile as possible. In the left iliac fossa was a mass perhaps 8 × 10 cm., which seemed to occupy the greater part of the left half of the pelvis. This mass was continuous with a smaller mass which passed below Poupart's ligament. The tumor was made more prominent on extension of the thigh. At operation the tumor was found to contain a clear viscid fluid, yellowish in color, together with six irregular cartilaginous masses lying free in the cavity. The wall of the tumor was composed of fibrous tissue through which were scattered plaques of cartilage and bone. The sac communicated with the synovial cavity of the hip-joint.

CASE XXII.—KUMMER. A man, aged fifty-nine, had been perfectly well until four years before. At that time he was bothered with a sharp pain in the antero-superior region of the hip. The pain frequently radiated to the knee. This gradually increased in severity. A year later there was noticed a slight swelling in the inguinal region. The articular movements were free. Under local treatment, the condition improved, only to recur four years later with the same inguinal swelling. The limb was in a position of slight flexion and outward rotation. Walking was painful and accomplished with the aid of a cane. In the inguinal region was a fluctuant tumor extending upwards beneath Poupart's ligament, and downwards as far as the region of the lesser trochanter. The femoral vessels were crowded inwards and forwards. The limb showed evidences of circulatory disturbances in the form of diffuse œdemas, varices, and purple patches. Movement at the hip was quite free except that extension and flexion were slightly limited, and internal rotation was almost abolished. The integrity of the bones was demonstrated by X-ray. On aspiration a viscous, mucoid fluid, yellowish in color, was obtained. As much as 250 c.c. were aspirated at one time. At operation the fibrous sac was seen to communicate with the hip-joint.

CASE XXIII.—LUND. A man, aged seventy, entered the hospital with a lump in his right groin, which caused considerable pain and stiffness of the leg. There had been no

CYSTS OF THE ILIO-PSOAS BURSA

movement of the bowels for two days. A diagnosis of strangulated hernia was made by another physician. The man was emaciated and showed osteoarthritic deformities of the finger joints. In the inguinal region behind and external to the femoral artery and just below Poupart's ligament was a fluctuating tumor half the size of an egg. A tentative diagnosis of deep abscess in front of the hip was made. Operation revealed a thin-walled cyst lying to the inner side of, and beneath, the ilio-psoas tendon. The cavity contained an ounce of serofibrinous fluid. The sac communicated with the hip-joint.

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VERTEBRAL EPIPHYSITIS

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Historical.—Under the term *kyphosis dorsalis juvenilis*, Scheuermann, of Copenhagen, in 1921, described this unusual affection of the spine.

Literature.—The literature on this subject is very scant. In the most recent article by Calvé, two cases are described, one seen by Calvé and the other by Brackett. Similar to the case here reported, both of these authors believed they were dealing with Pott's disease.

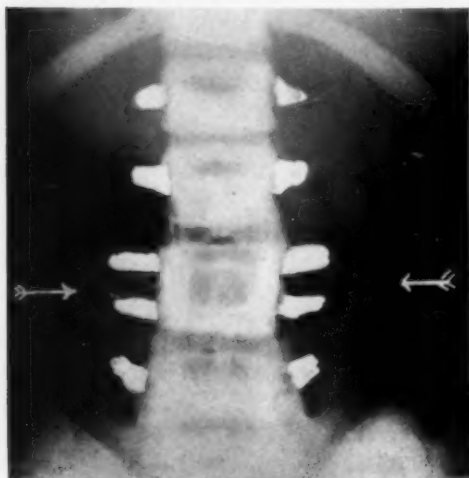


FIG. 1.—Fusion of third and fourth lumbar vertebrae simulating bilateral double transverse processes. (Antero-posterior view.)

Embryology.—The embryology of the spine offers information of great interest and importance. There are two epiphyses for each vertebral body; one at the upper pole and one at the lower. These unite with the body at about the eighteenth year, therefore epiphysitis cannot occur after this period. However, before this period of fusion occurs the vertebral epiphyses are subject to the same conditions that any epiphysis is.

Etiology.—The etiology of this condition is found in the following factors: Firstly, infection locally and remotely; secondly, circulatory disturbance in the nature of embolism, thrombosis, etc.; thirdly, trauma both internal and external, and fourthly, glandular disturbance, affecting bone growth and development.

Pathology.—The pathology is that of an epiphysitis.

Symptoms and Signs.—The signs of an epiphysitis are similar to those of an early tuberculosis, *viz.*, limitation of motion, muscle spasm, military attitude, pain, night cries, tenderness, and sensitiveness to jarring.

Röntgenography.—Antero-posterior and lateral views should be made and reveal characteristic involvement in region of epiphysis. No exudate is seen.

Diagnosis.—The direct diagnosis is based upon the findings outlined above. The differential diagnosis is important especially from the standpoint of prognosis.

The conditions to be considered are especially tuberculosis, rickets, and trauma. *Tuberculosis* is manifested by limitation of motion, muscle spasm, pain, night cries, röntgenographic evidence, *i.e.*, haziness and diminution of

VERTEBRAL EPIPHYSITIS

intervertebral space, destruction of bone in anterior portion of vertebral body exudate, deformity, abscess, etc. *Rickets* is characterized by a long, round kyphos, which is easily reducible, other evidences of rickets, such as rosary, square head, irregular broad epiphyses, pot belly, Harrison's groove, bone deformities, *i.e.*, knock-knees, bow-legs, etc., disturbed dentition and altered blood chemistry. *Traumatic* spine conditions are diagnosed by a history of injury, examination of the spine and röntgenographic studies. A complete differential diagnosis is given in a paper by the writer in the *Illinois Medical Journal* for January, 1925.

Prognosis.—The prognosis is excellent if proper treatment is instituted.

Course.—The course is comparatively short. Undoubtedly many cases reported as cured tuberculosis of the spine were really cases of epiphysitis.

Treatment.—The treatment should be the same as for mild or early tuberculosis, *viz.*: Absolute recumbency on a bed frame made of gas pipe, according to Bradford or Whitman, with traction applied to the head or legs or both.

Immobilization accomplished by plaster-of-Paris cuirass or spine braces.

Heliotherapy is most valuable, and if it can be properly given, is probably the only treatment necessary, excepting a simple spine support. Hygienic conditions must be maintained. Dietetic factors are very important. If glandular disturbances are present they should be treated. All foci of infection should be removed.

CASE REPORT.—The case here reported has been under observation by Dr. John L. Porter and the writer, over a period of about nine years. It is not a proven case. Having been diagnosed and treated for tuberculosis of the spine, she made a complete recovery with perfect motion and no deformity. The writer therefore believes it was not tuberculosis but vertebral epiphysitis.

V. H., white girl, age thirteen years, a pupil at The Spalding School for Crippled Children, was first seen by Dr. John L. Porter at St. Luke's Hospital, when she was three years old, when the following data was obtained:

History.—Complaint of pain, tenderness and rigidity of spine. *Personal History.*—Birth normal, June 6, 1911. Breast fed, walked at twelve months and talked at two years

Previous Diseases.—Measles, whooping cough, pneumonia, typhoid.



FIG. 2.—Line of fusion of third and fourth lumbar vertebrae at junction of upper and middle thirds of composite vertebra. (Lateral view.)

PHILIP LEWIN

Family History.—Her father and brother are well. Her mother has "kidney trouble." Her father's sister died of tuberculosis four years ago, and her mother's sister died of intestinal tuberculosis. The child has never been in contact with any of the family who had tuberculosis.

History of Trouble.—Child is said to have curvature of the spine, which father noticed when she was three years old. Her stomach began to be prominent. There were no other symptoms. Her back became steadily worse. Two months ago she complained of pain on right side. This was present at night only. She cried during sound sleep. This has become more constant during past two weeks. At present night pains trouble her. She eats well except when teeth bother her; many teeth are decayed and loose. Her father thinks she is losing in weight and strength. She was referred to The Children's Memorial Hospital where a diagnosis of tuberculosis of the spine was made and proper treatment recommended. She was referred to St. Luke's Hospital, where she was examined by Doctor Porter and the writer, and the following findings observed:

Physical Examination.—Muscle spasm of marked degree, tenderness to pressure and sensitiveness to jarring over the second and third lumbar vertebrae. The lumbar spine is rigid in all directions. There is a slight left scoliosis. There is a marked lumbar lordosis. Her mouth and teeth are in very bad condition.

Röntgenograms (which unfortunately have been lost) revealed evidence of tuberculosis of the third lumbar vertebra.

She was treated by absolute recumbency on a Bradford frame with head traction and elevation of the head of the bed. This was followed by repeated plaster-of-Paris jackets and finally a Taylor spine brace.

At present she is evidently cured. She has perfect spine movements without a sign of deformity and has no symptoms whatsoever. She was demonstrated by the writer before the Central States Orthopedic Club in 1919, as a case of cured tuberculosis of the spine with perfect motion and no deformity.

Röntgenograms reveal in antero-posterior projection (Fig. 1) what appear to be bilateral double transverse processes of the fourth lumbar vertebra, but is in reality a fusion of two vertebrae. The third and fourth lumbar vertebrae have united. In the lateral view (Fig. 2) there can be seen a definite line of fusion at the junction of the upper and middle thirds of this composite vertebra.

Conclusions.—Vertebral epiphysitis is a definite pathological entity and is analogous to Legg-Calvé-Perthes disease of the hip; to Osgood-Schlatter's condition in the upper tibial epiphysis; to Köhler's tarsal scaphoiditis; to Freiberg's infraction of the metatarsal head, to carpal epiphysitis, and to apophysitis of the os calcis.*

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* Recently Stern, of Cleveland, demonstrated a similar condition in the lower tibial epiphysis.

CLOSED REDUCTION OF ACUTE DISLOCATIONS OF THE SEMILUNAR CARPAL BONE

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THESE particular cases are reported because of the successful attempts at the closed method of reduction, the full functional results obtained and the complications of a fractured scaphoid and fracture of the styloid process of ulna in case one, and a fracture of the styloid process of the ulna in case three.

Dislocations of the semilunar carpal bone are frequently undiagnosed because of the failure to make a thorough physical examination with proper radiographic interpretation in every suspicious injury to the wrist-joint. Because of these incomplete examinations marked disabilities have resulted.

If semilunar dislocations are diagnosed immediately following injury and the closed method of reduction attempted, as described by Davis, the majority can be reduced, thereby lessening a long period of disability as well as obtaining good functional results. In this method care should be taken that too much trauma is not used because marked injury can be done to wrist-joint structures causing greater disability than if the dislocation had been left alone and later the bone removed. However, no disability resulted from trauma in any of these cases. The use of the fluoroscope is indispensable in this type of case and should always be used.

Briefly outlined, the closed reduction method, or broomstick method of Davis, is as follows: The curved surface of the side of a broomstick handle is placed at the lower tip of the semilunar bone on its radial articular aspect. By increasing the deformity of the dislocation, that is, extreme extension of the wrist, and by gradually making traction on the hand, with broomstick in place making pressure against the dislocated semilunar, the hand and wrist are acutely flexed, causing the semilunar to be reduced. The traction on the hand is important, because this increases the space between the radius and os magnum, making room for the semilunar carpal bone. Extreme flexion is also necessary.

In this series of cases it was found that when the wrist remained in right angle flexion without force and did not have a tendency to rise up, the semilunar was always reduced.

Diathermy in sedative doses, with radiant light, was found to relieve the pain and rapidly diminish swelling as well as lessen the period of functional disability. Immediate mobilization of wrist as soon as possible is very important.

The force producing the dislocations was found to be directed from the

flexor to the extensor surface of the wrist, with the wrist and hand in extreme extension.

CASE I.—On September 17, 1924, while loading a coal car, L. H., colored male, twenty-four years old, miner, received an injury to right wrist. L. H. stated he caught his hand between a car and the roof of the mine, at the same time causing a very marked backward bending of the wrist. The patient was seen by me four days later. Examination showed marked swelling and tenderness of right wrist, with very limited motion. Radiographic examination of the right wrist revealed a dislocation of the semilunar bone with fracture of the scaphoid and fracture of styloid process of right ulna (Fig.

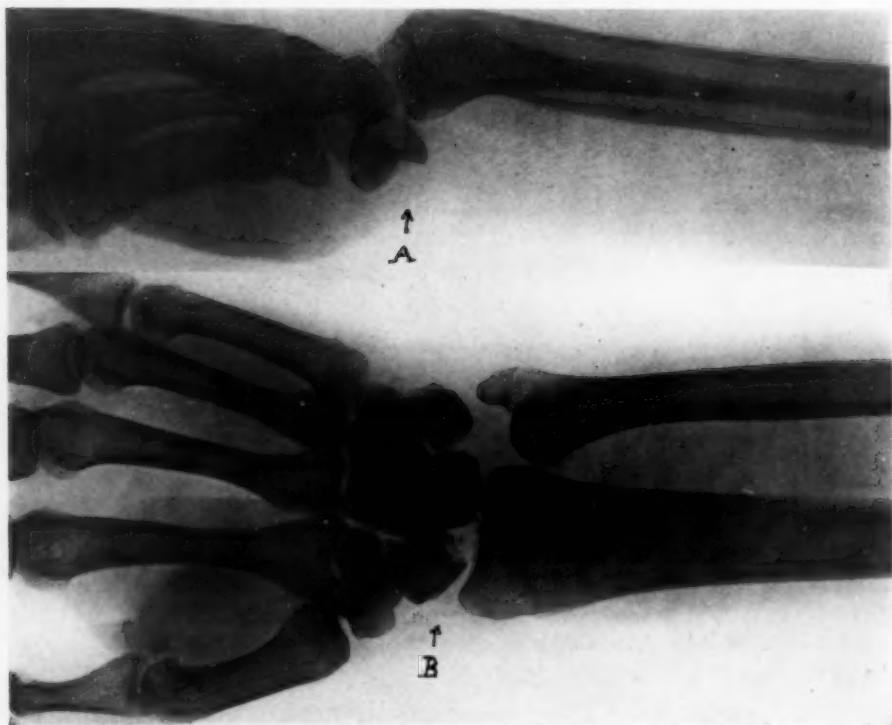


FIG. 1.—Röntgenogram showing dislocation of semilunar bone, with fracture of scaphoid and ulnar styloid process. A. Lateral view. B. Antero-posterior view.

1, A and B). Ether anæsthetic was given September 12, 1924, and the closed reduction method used.

Successful reduction was accomplished, the wrist was placed at an angle of 15 degrees flexion and 20 degrees adduction. The right thumb was adducted to base of the index finger and anterior and posterior wooden splints applied. On the fifth day, splints were removed daily and hot baths applied to wrist and hand. On the sixth day the wrist was placed on a cock-up splint and thumb was kept adducted. Active motion was also accomplished daily after the sixth day. The wooden splints were entirely removed on the fourteenth day, and diathermy was commenced daily and used for four weeks thereafter, as well as daily hot baths, radiant light, active and passive motion. Radiograph six weeks following injury showed good union of fractured scaphoid and fractured styloid. The patient returned to work in eight weeks following injury. There were full functional results in this case. Patient's delay in returning to work earlier than eight weeks was due to the fractured scaphoid.

DISLOCATIONS OF SEMILUNAR CARPAL BONE

CASE II.—While loading timber on a car, August 14, 1924, L. M., colored male, age twenty-seven, miner, caught his right hand between two timbers, twisting his wrist and at the same time bending his wrist and hand backward. The patient was seen by me on August 23, 1924, nine days following injury. Examinations of the right wrist showed very marked swelling and tenderness with limited motion. Radiograph showed dislocation of right semilunar bone. Ether anaesthetic was given on August 23, 1924, and the closed method used. Reduction was successful. The wrist was placed in 15 degrees flexion and 20 degrees adduction and anterior and posterior splints applied. Wrist brought to mid-flexion and extension on third day. Splints were entirely removed on the sixth day and hot baths, diathermy, massage, radiant light and active and passive

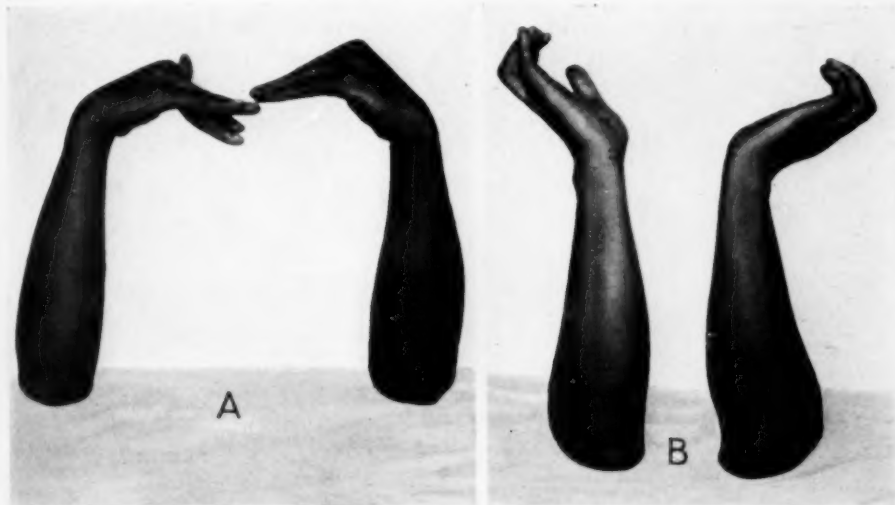


FIG. 3.—Final results obtained in Case I, L. H., as regards flexion and extension of the injured wrist.
A. Flexion. B. Extension.

motion were used daily. The patient had excellent functional results, and he returned to work four weeks following the closed reduction.

CASE III.—On March 26, 1925, A. P., white male, age fifty, carpenter, stated that he fell off a scaffold about ten feet high, catching all his weight on his right hand while hand was in full extension. Was seen by me on March 29, 1925. Radiographic examination showed dislocation of the right semilunar carpal bone and fracture of styloid process of the right ulna. Physical examination showed right hand and wrist very swollen with marked tenderness and practically no flexion or extension in wrist. Ether anaesthetic given March 29, 1925, and the closed method used. Successful reduction was accomplished, posterior wooden splints applied with wrist in 20 degrees adduction and 15 degrees flexion. Hand was placed in mid-flexion and extension at wrist on the fourth day and hot bath was given to hand and wrist daily thereafter. Wooden splints were removed entirely on the eighth day, and diathermy commenced daily. Patient was allowed to gradually use active and passive motion. Was able to return to work within five weeks from date of injury. Good functional results obtained.

SUMMARY

1. All injured wrists should have careful physical and radiographic examinations.
2. Closed reduction should be attempted on all acute dislocations of semilunar carpal bones.

H. EARLE CONWELL

3. Great care should be exercised as regards too much trauma in using the closed reduction.

4. Diathermy, active and passive motion and hot baths should be commenced as early as possible.

N. B.—I am indebted to Dr. G. Walsh and Dr. I. M. Gravlee, Röntgenologist, Employees Hospital, Fairfield, Alabama, for their able assistance in these cases.

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ARTERIOVENOUS FISTULA

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ARTERIOVENOUS aneurism, owing to its spectacular pathology and comparatively rare occurrence always excites more than a passing interest. The World War with its hitherto unprecedented incidence of vascular injuries afforded ample opportunity for the study of the immediate and remote developments arising from this particular condition, and recent literature has been enhanced by a number of excellent contributions to our knowledge of the subject. Particular stress has been laid on the effects of an arteriovenous fistula on the cardiovascular system, which have been thoroughly studied experimentally and clinically by Reid, Matas, Holman and others. The following case may be of interest as illustrating particularly the reaction of the cardiovascular system to an arteriovenous fistula of long duration.

CASE.—V. B., a cattleman, aged twenty-four, came to us in July, 1923, complaining of a persistent sore on his left leg of some two years' duration. His family history and personal history were entirely negative. Ten years previously he had received a stab wound low down in his left thigh on the medial aspect. There had been much bleeding at the time, but the wound had healed promptly and had given no trouble until two years ago. At that time he was cut by barbed wire on the outer aspect of his left leg, sustaining a wound which persisted for two years, during which time he was able to do practically no work. He had no other complaint.

The patient was a well-developed, muscular man, apparently in good physical condition. There was a slight cyanosis of the face which amounted, apparently, to little more than a healthy flush. One was immediately impressed with the unusual appearance of the left leg and thigh. The left limb was definitely larger than the right. The superficial veins and capillaries of the left leg were greatly engorged and the skin had a mottled cyanotic appearance, resembling that of extensive varicose veins. On the outer surface of the leg, in the area of greatest discoloration, was a linear ulcerating wound. This healed promptly after application of a pressure bandage. On the inner aspect of the left thigh, in its lower third, was the small scar of a stab wound received ten years ago.

On palpation of the thigh a continuous thrill was felt which was most marked in the region of the scar and was perceptible from Poupart's ligament down to the ankle. It was reinforced and intensified with each heart beat. Auscultation of the thigh revealed a loud, characteristic bruit—a "continuous roaring sound like that of distant machinery or of a train passing over a bridge." This could be heard well up in the abdomen. There was marked pulsation of the femoral vessels on the left above the fistula. Pressure over the scar resulted in cessation of the thrill and bruit. The same effect was obtained from pressure over the femoral vessels below Poupart's. No pulsation could be made out in the left dorsalis pedis and posterior tibial arteries. Pulsation in the superficial veins of the leg was not observed. There was no marked difference in the temperature of the two limbs. The patient said they felt about the same.

While there were no cardiac symptoms in the history the heart was greatly enlarged. The P. M. I. was seen and felt in the fifth interspace $7\frac{1}{2}$ cm. from the midline. The relative cardiac dullness extended 10 cm. to the left by 5 cm. to the right. On auscultation the heart sounds were regular and forceful. There was a barely perceptible systolic

murmur best heard at the base. Aortic and pulmonic second sounds were both diminished in intensity. The heart sounds were exceptionally clear in the fourth interspace on the right.

The pulse was regular in force and rhythm, of good volume, rate 92, tension (brachial) 120/45. Branham's bradycardiac phenomenon was marked in this case. When the fistula was so compressed as to cause complete cessation of the bruit, the pulse fell immediately to 72 and the diastolic pressure rose from 45 to 80, the systolic pressure remaining unchanged at 120.

Special Examinations.—A teleo-röntgenogram showed a combined measurement of

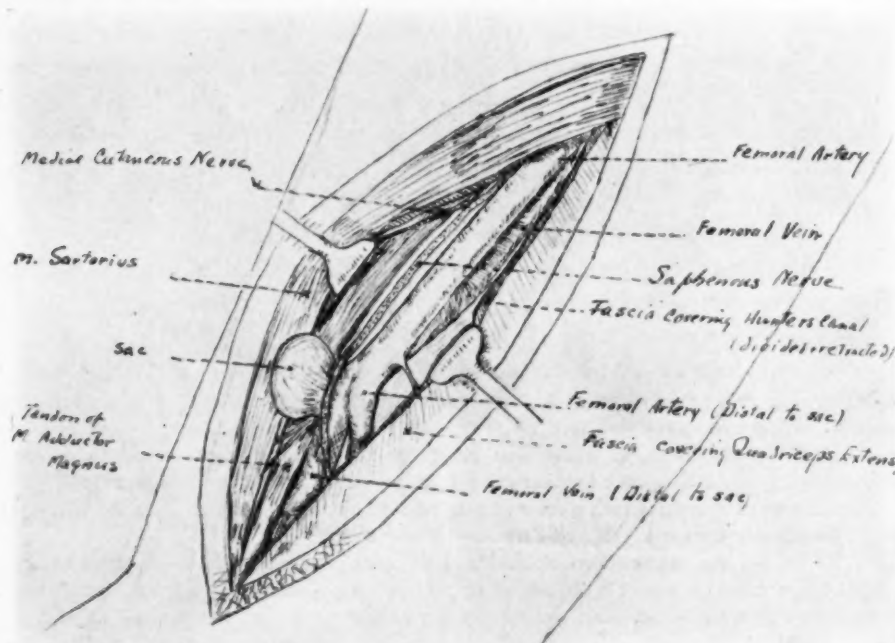


FIG. 1.—Sketch of the fistula between the femoral artery and vein as seen at the operation.

17½ cm., verifying previous observations on the heart. At a later date the above pulse and blood-pressure observations were verified with the following results:

Blood-pressure prior to occlusion of fistula, 128/66.

Pulse prior to occlusion of fistula, 92.

Blood-pressure after occlusion of fistula, 128/92.

Pulse after occlusion of fistula, 60.

It was apparent from these readings that occlusion of the fistula lowered the pulse-rate 32 beats while at the same time it elevated the diastolic pressure some 26 millimetres. The systolic pressure showed no variation.

The following test was made to ascertain the efficiency of the collateral circulation. The fistula was occluded by compression until thrill and bruit had ceased. An Esmarch bandage was then applied from the toes to the knee and left in place ten minutes. It was then removed, and it was noticed that the hyperæmic wave of returning blood advanced rapidly downward into the foot and toes, showing the presence of adequate collateral channels. It is obvious that this observation was very comforting to the surgeon, who is always confronted in these cases with the possibility of gangrene of the parts distal to the fistula.

Laboratory examinations were essentially negative. Red blood-cells numbered

ARTERIOVENOUS FISTULA

4,290,000; leucocytes, 10,300; and the hæmoglobin was 90 per cent. The urine was negative.

Operation.—On February 7, 1924, operation was performed by Dr. F. C. Beall under local anæsthesia. No tourniquet was used. With the knee and thigh slightly flexed, incision was made over the lateral border of the sartorius muscle, which was exposed and retracted. The medial cutaneous nerve of the thigh was seen beneath it. The fascia overlying Hunter's Canal was incised, exposing the femoral artery and vein and the saphenous nerve lying in the adductor canal. In the lower end of the canal a tense rounded sac was seen, in size slightly smaller than the distal phalanx of the thumb, which protruded from the wall of the femoral vein medial to the saphenous nerve, which was densely adherent thereto. Just proximal to this sac the artery and vein were joined together, the vein passing around medial and superficial to the artery, which ducked away inward toward the popliteal region (Fig. 1). It was noted with interest that the proximal artery was not as large as we expected to find it, being only about three-eighths of an inch in diameter. The distal artery was about half as big.

The femoral artery was now occluded above the fistula with apparently little effect on the thrill or the sac, which still remained tense. Inspection of the lower leg after this manœuvre revealed the circulation unimpaired. Both afferent and efferent veins were now occluded and the sac became very tense due to blood entering it through the distal artery—again assuring us of adequate collaterals.

All four radicals were now ligated with linen, and the fistula was excised. The femoral artery was increased in diameter by a half, and the pulse which had been 92 fell immediately to 40. The circulation in the leg remained good. Examination of the excised fistula showed the artery and vein tightly glued together with a slit-like communication in cross-section about the size of an ordinary lead pencil.

The following observations were made on the pulse and blood-pressure after operation:

- (1) Immediately after operation: Pulse 56, regular; blood-pressure, 142/90.
- (2) Second day, A.M.: Pulse 68, regular; blood-pressure, 150/80.
- (3) Third day, A.M.: Pulse 68, regular; blood-pressure, 135/80.
- (4) Third day, P.M.: Pulse 78, regular; blood-pressure, 128/88.

Recovery in the hospital was uneventful, except for a slight wound infection, which cleared up rapidly. On the second day after operation a good pulsation was made out in the posterior tibial artery (none had been detected prior to operation), but none in the dorsalis pedis. The patient was discharged at the end of the second week in good condition. When seen on February 23, he was still doing well. His pulse was regular, about 80. There was no swelling in the leg, which had lost its cyanotic appearance and appeared even smaller than the right leg, whereas before operation it had been larger.

On February 29 he looked badly and had evidently lost some weight. During the week previous he had been easily tired, though doing no work, and had not felt well. Examination revealed a pulse exceedingly irregular both in rate and force of the beats. There were many extrasystoles with a pulse deficit of about 40. The pulse could not be counted with accuracy, but was well over 100 per minute at the apex. The blood-pressure was 112/65. Evidently we were dealing with a greatly disturbed cardiac mechanism.

The patient was sent to the hospital, where after a course of rest and digitalis his arrhythmia disappeared. When discharged on March 13, his pulse was 100 and quite regular; his blood-pressure was 108/70. He felt well and seemed much improved. There was no swelling in the left leg. A note from his physician dated August 12, 1924, reports his blood-pressure 115/70 and his pulse 80 to 92, full and regular. He adds that the patient does general ranch work, avoiding heavy lifting and "extra-hard broncho-busting" and is to all appearances a normal man.

Comment.—In a discussion of the preceding case several features are worthy of note. These are, briefly; (1) Branham's bradycardiac phenomenon and associated blood pressure variations, (2) The presence of marked cardiac hypertrophy and dilatation without other symptoms of decompensation, (3) The relatively slight dilatation of the proximal artery, (4) The well developed collateral circulation, and (5) The unusual and remarkable cardiac behavior following operation.

The behavior of the pulse in this patient is typical of the phenomenon first observed in 1890 by Branham, a Georgia surgeon, and named accordingly Branham's bradycardiac phenomenon. These observations were made before the days of accurate blood pressure estimation and concerned only variations in the pulse rate. Later it was found that these pulse variations were accompanied by coincident changes in the general blood pressure. In this case it was observed that when the fistula was completely closed by external pressure the pulse rate fell immediately from 92 to 60, while the diastolic pressure rose from 66 to 92. Interesting to relate, the systolic pressure remained practically at 128.

Holman in the *Archives of Surgery*, July, 1923, presented a somewhat similar case of popliteal arteriovenous fistula of twenty-five years' duration with marked cardiovascular changes. He found that "closure of the fistula by simple compression caused a momentary increase in general blood pressure from 118/66 to 160/90 with a rapid subsidence to 126/88, where it remained until the fistula was again opened. Then it fell precipitately to 96/48 with a rapid recovery to 116/66. Pulse variations accompanied these changes, a pulse of 76 dropping to 38 when the fistula was closed, with recovery to 80 when the fistula was opened."

In that and in subsequent contributions to the subject Holman has worked out thoroughly the physiology of this phenomenon. He has shown that perhaps the most important readjustment following the production of an arteriovenous fistula is an increase in the total blood volume which is proportional to the size and duration of the fistula. Closure of the fistula by compression or excision restores the normal vascular mechanism—except for this increased blood volume, and is followed immediately by an attempt on the part of the heart to readjust itself to the new situation. This reaction, as we see it here illustrated, is Branham's sign. Failure of the heart to react thus—*i.e.*, absence of Branham's sign—may be sign of a greatly weakened myocardium and therefore of bad prognostic import.

A very interesting finding in this case was the marked enlargement of the heart which was readily apparent clinically and strikingly shown in the teleoröntgenogram. Clinically, there was definite preponderance of the right heart. The X-ray revealed a regular "cor bovis" with a combined diameter of 17.5 cm. Holman's case showed a similar enlargement with a combined diameter of 15.8 cm. That this is by no means the rule is shown by the fact that in the 447 recorded cases studied by Callander only 16 showed cardiac

ARTERIOVENOUS FISTULA

dilatation and hypertrophy accompanied occasionally by auricular fibrillation and myocardial decompensation. Interesting to relate, our patient complained of no symptoms of decompensation, and after his leg ulcer yielded to pressure bandaging, was able to do a days work up to the time of operation. The fact that he had a large heart which would eventually fail under its increasing burden, formed the main indication for operation.

That this enlargement of the heart is caused by both dilatation and hypertrophy is a reasonable assumption and has been demonstrated by Holman in experiments on dogs. He found that after an arteriovenous fistula had been established and allowed to persist for a certain length of time, there occurred in addition to the marked cardiac dilatation a definite increase in the weight of the heart, which he concluded must be hypertrophy.

The reason for this hypertrophy is increased work imposed on the heart somewhat as follows. In the presence of a fistula there is a marked fall in arterial pressure due to the leak in the arterial system, which is likewise the cause of a tremendous increase of pressure in the vena cava. In order to maintain sufficient pressure in the arteries to sustain life, the heart must put forth in a given time a greatly increased volume of blood. In addition to this it is whipped up from behind, so to speak, and made to beat faster by the onrush of blood into the right auricle. With the increased blood volume it dilates promptly and in due time hypertrophy naturally ensues.

Of the 447 cases of arteriovenous fistula studied by Callander a rather small percentage, 12.7 per cent., showed proximal dilatation of the artery. It is interesting to note that our case showed little enlargement of the artery above the fistula—far less than we expected to find considering the remoteness of the initial injury. A discussion of this case would be incomplete without a consideration of the cause of this phenomenon. Holman gives us a very thorough and concise explanation in the following: "An explanation of the proximal dilatation of the artery and vein is found by reverting again to our conception that the introduction of a fistula into the circulation results in establishing two systems of circulating blood where only one existed before, namely: A, heart-artery-capillary bed-vein, and B, heart-artery-fistula-vein. It is obvious that the volume of blood that is short-circuited through system B depends on the size of the fistula, the character of the opening, and the absence of any venous obstruction proximal to the fistula. If the fistula is large enough, the entire volume of blood flowing into the artery proximal to the fistula will be diverted through the opening. If the fistulous opening is larger in cross-section than the artery, and if there is no venous obstruction proximal to the fistula, the only curb to the amount of blood that will flow through the fistula is, first, the limited distensibility of the arterial wall leading to it, and, second, the resistance to expansion of the artery offered by the tissues and structures surrounding the vessel. The artery, however, is an elastic tube and the surrounding structures are non-rigid, compressible tissues. As a result, resistance to distensibility is in fact small, and, obeying the

maxim that flowing water seeks the path of least resistance, a larger and larger volume of blood will find its way into the vessel and through the fistulous opening, thus producing by the force of the column of blood directed toward the fistula, a gradual distention and dilatation of the feeding artery and receiving vein. This distention responds slowly but certainly to the increasing blood volume flow, until a point is finally reached where the combined resistance to the blood flow offered by the fistulous opening itself, plus the limited distensibility of the vessel wall to a further dilatation of the vessel, equals the resistance to the blood flow offered by the capillary bed in the system A. When this equalization of resistances is reached, the two systems are in equilibrium; the volume of blood flowing through the fistula will no longer increase, and therefore the total volume will also remain constant. It is my belief that when this equilibrium is reached, no further dilatation of the vessels and heart can or will occur. This dilatation is accomplished against the resistance to expansion offered by the vessel itself, and by the resistance offered by the surrounding tissues. It is, therefore, of necessity a slowly progressive process, and all writers have emphasized the long duration of the fistula as a prominent feature of the vessel and heart changes, when in reality the most important factor is the size of the fistula and the absence of any obstruction in the vein proximal to the fistula. Duration of the fistula is obviously not the reason for the dilatation, but in the presence of a large fistula it has a distinct bearing on the extent of the dilatation."

From the above it is apparent that the minor degree of dilatation of the proximal artery in this case was due to the fact that the size of the fistulous opening was no greater, but probably less than the area of the artery in cross-section. It will be remembered that the leak was about the diameter of a common lead pencil. The facts in our case tend, then, to verify Holman's statement.

A fourth feature to be noted in this case was the very efficient collateral circulation which made possible ligation of all four radicals and excision of the fistula. The improvement in the circulation of the leg was prompt and remarkable, and the customary bugaboo of gangrene troubled us not at all. The patient would have had an uneventful recovery but for the appearance of a complication which may be considered as a fifth outstanding feature of this case.

It will be noted that observations on the pulse and blood pressure after operation showed a marked increase in both systolic and diastolic pressures with a corresponding slowing of the pulse. By the third day the systolic blood pressure had returned to its pre-operative level. The diastolic reading remained at a normal figure, 80, and the pulse came up to 72 and was regular. On February 23 after being up and about the patient continued to be in excellent shape. Five days later we were rather amazed to see him pale and weak and suffering from shortness of breath. His pulse was definitely that of auricular fibrillation. The blood pressure had fallen to 112/65. After a period

ARTERIOVENOUS FISTULA

of rest and appropriate medication he improved, and six months later showed no effects of myocardial disease.

Although auricular fibrillation in an overburdened heart has been noted occasionally in these cases prior to operation, I find to mention of its occurrence after repair of the fistula, as is so strikingly shown in our patient. Matas mentions a temporary post-operative tachycardia which came on immediately after repair of the fistula in three cases of femoral arteriovenous aneurism, and subsided in a few hours. In one of these the pulse rose suddenly from 110 to 200 beats per minute. He gives no reason for this other than "the disturbed balance of the circulation brought about by closure of the fistula."

Holman has observed clinically and proved experimentally that one of the main adjustments following the formation of an arteriovenous fistula is a definite, though gradual increase in the total blood volume. It is to this increase in the fluid content of the blood that he ascribes Branham's phenomenon and the heightened blood pressure which gradually returns to normal after excision of the fistula. He was able to demonstrate on the dog both the increase and, after the repair of the fistula, the gradual decrease in the total blood volume.

It is conceivable that in our patient the sudden changing, by excision of the fistula, of the habits and routine, as it were, of the heart for ten years past, might entail an abrupt and very considerable readjustment of that organ to the new conditions. Immediately on closure of the fistula it was noted that the pulse dropped to 40 and that the femoral artery increased in size by one-half. At this time there was probably also a temporary dilatation of the heart, sufficient to cause definite damage to the myocardium. This damage was not sufficient to make any difference while the patient remained in the hospital in bed, but when more activity was undertaken the still damaged myocardium was manifested by signs of decompensation. The gradual recovery also suggests this possibility. The increased blood volume above mentioned, though a factor in causing the myocardial injury, was probably gone on the third day when the blood-pressure returned to normal.

SUMMARY

A case of arteriovenous fistula of the femoral artery and vein is presented, showing:

- (1) Branham's sign and associated blood-pressure variations, due to an increase in blood volume caused by the fistula.
- (2) Cardiac dilatation and hypertrophy—the result of increased volume flow through the heart incident to the production of the fistula.
- (3) Slight dilatation of the proximal artery—due to the small size of the fistulous opening as compared to the cross-section of the artery.
- (4) Marked development of the collateral circulation following formation of the fistula.

THOMAS HERBERT THOMASON

(5) Unusual occurrence of auricular fibrillation three weeks after operation, ascribed to failure of the heart following damage to the myocardium at the time of repair of the fistula.

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TRANSACTIONS
OF THE
PHILADELPHIA ACADEMY OF SURGERY

Stated Meeting Held April 6, 1925

DR. EDWARD B. HODGE, the President, in the Chair

BULLET PERFORATING VENTRICLE OF HEART AND MIGRATING BY
WAY OF ARTERIAL CIRCULATION TO SUPERFICIAL
FEMORAL ARTERY

DR. JOHN H. JOPSON presented a colored man, aged thirty-nine years, who was admitted to the Polyclinic Hospital, August 28, 1924, on account of a gunshot wound of the chest just received at close range. He was a large, well-developed and well-nourished man in a moderate state of shock. There was a gunshot wound of the left thorax, the bullet entering at the third interspace, about one and one-half inches from the midline of the sternum. No point of exit could be found. There was a slight sanguinous discharge from the wound. Respirations were dyspnoeic in character. His lungs revealed nothing abnormal. The heart rate was somewhat increased but was regular. The cardiac sounds were distinct. No murmurs were heard. There was no evidence of hypertrophy. The abdomen and extremities were grossly negative. He complained of some pain in the right leg. Wassermann was negative. Urine was negative.

He was given treatment for shock and then placed in Fowler's position with enough morphia to insure rest. A röntgenogram was taken in an endeavor to localize the bullet, but no signs of foreign body in the left chest could be detected. There was a density, throughout the whole left chest, about the consistency of the liver, which suggested fluid. The temperature was 103.2, pulse 120, respiration 40. There was slight cough but no bloody expectoration. Aspiration of the left pleural cavity on two occasions resulted in a dry tap. A re-ray of his chest on September 5, again failed to demonstrate any evidence of foreign body. The opacity in the left chest, resembling fluid was still present. As the patient complained of pain in the right lower leg, an X-ray was taken of the right tibia and fibula. This was reported negative.

Further röntgenographic study on October 10 disclosed many fibrous adhesions in the left chest. These were thought to be due to old exudate or blood, which had been absorbed. There was an adhesion of the left diaphragm but no foreign body was detected. The patient was transferred to the Medico-Chi Hospital on October 13, for further study. His temperature still remained elevated and a röntgenogram, taken on December 2 was reported as follows: No evidence of effusion at this date. Still abnormal widening in the mediastinal shadow. A bullet was detected at right thigh, internal mid-region.

On December 16, the bullet was localized by fluoroscope. It was situated in the right thigh, at the junction of the middle and lower thirds, on the inside of the femur. At this time all chest symptoms had practically disappeared. He had a slight elevation of temperature, which was apparently due to a cellulitis and abscess of the right leg, on the outer side, about the middle third.

There was an absence of pulsation in the right popliteal and anterior and posterior tibial arteries. There was no swelling or other evidence of defective circulation in the limb, except this absence of pulsation in the arteries.

A review of the history and study of the X-rays, and of the fluoroscopic findings, apparently show that the bullet, of 38 calibre, had entered the precordial region, had perforated the pericardium and entered, either the aorta, which was most probable from the situation of the wound, or the upper portion of the left ventricle, and was swept at once into the arterial circulation, finally lodging in and plugging the right superficial femoral artery, in the upper portion of Hunter's canal.

The collateral circulation had taken care of the nutrition of the limb below. Further study of the X-ray plates, along with the history, led to the belief that the shadow in the left chest was due to a large hemorrhage into the pericardium, although this has not been verified by repeated, careful examinations by the physicians, who saw him in consultation at the Polyclinic Hospital.

Aspiration of the right lower leg showed the presence of pus and a free incision was made in the outer side, middle third, and a considerable collection evacuated beneath the deep fascia and dissecting between the extensor muscles. Dakin's tubes were inserted two days later and active dakinization of the wound was begun. There was rapid improvement and the patient was discharged on November 4, with instructions to report to the dispensary for daily dressings. On November 12, he had some pain in the line of incision. The wound was incised and a quantity of pus was evacuated. He was readmitted to the hospital on November 15, for a more complete incision of the infected leg. His temperature, at the time of re-admission, was 99, pulse 110, respirations 24. An incision and drainage of the abscess was made on November 17, and the wound was again actively dakinized. Temperature remained slightly elevated until December 14, when it rose to 102°. Aspiration revealed the presence of a pus pocket, in the same region. This was incised and drained on December 19.

Incision and drainage of pus pockets were again made on January 21 and January 31, 1925. The pulsation in the vessels returned several weeks after his transfer to the Medico-Chirurgical Hospital. He has been very ill, from time to time, from relapsing infection of the leg, cultures from which showed non-haemolytic streptococci. At no time has there been any local reaction at the site of the bullet, and for this reason, no attempt to remove it was considered indicated. It is quite possible, however, that the infection travelled downward from the site of the bullet, as there was absolutely no portal of entry elsewhere as determined by repeated, exhaustive examinations by Doctors Rothschild and Farrell.

Examples of the entrance of foreign bodies, bullets or shell fragments into the circulation, while rare, have been noted with increasing frequency since the introduction of the X-ray and especially since the last war. Matas, in his article on Military Surgery of the Vascular System, volume vii, *Keen's Surgery*, gives a highly interesting résumé of the subject.

The cases may be divided into two general classes:

I. Those in which the foreign body enters the left heart and is carried through the aorta into the smaller arteries, being arrested at a point, where the lumen of the artery becomes too small to permit further passage.

Matas refers to six cases of this type, the oldest one reported in 1837.

II. Cases in which the foreign body enters a vein and progresses from the periphery to the right heart. Reaching the auricles, it may remain there, or progress further through the pulmonary artery to the lung, or it may pursue

ACUTE DILATATION OF THE STOMACH

a reversed course from the right chambers into the venous circulation against the current. Those cases, migrating with the circulation, naturally exceed in number those migrating against the current. They may even enter the pulmonary artery and travel against the current into the right heart.

ACUTE DILATATION OF THE STOMACH AND TETANOID CONVULSIONS FOLLOWING OPERATION FOR HERNIA

DR. JOHN H. JOPSON presented a man, aged thirty-seven, who was admitted to the Medico-Chi Hospital, February 1, 1925, for operation for a large right scrotal hernia. He was a well-nourished, rather stockily built man.

Operation was performed by Doctor Jopson, February 2, and a complete, indirect, inguinal hernia was found with the major portion of the small intestine in the sac. Radical cure was effected by the Stetten modification of the Bassini method.

The patient reacted well from the anæsthesia and slept the greater part of the day, vomiting once that evening. He had a fairly good night but was nauseated and vomiting the following morning. Temperature was 100.2, pulse 110, respiration 28. Gastric lavage was administered, but the vomiting continued and a Jutte tube was inserted through the nostril into the stomach and fixed in place with adhesive for constant drainage. The material obtained from the stomach consisted of dark brown, granular appearing fluid. The abdomen was somewhat distended and hiccoughing occurred at short intervals. Twenty-five minims of ether were given intramuscularly for the hiccoughs. The Jutte tube continued to drain this dark brown material, but as the fluid became clear, the tube was removed from the stomach. One thousand c.c. of normal saline solution were given per hypodermoclysis.

Vomiting again occurred and the tube was re-inserted into the stomach. Hiccoughing still continued and the abdomen remained somewhat distended. Asafætida enemas were given to relieve this condition and were effectual. The fourth day after operation, the patient's condition was decidedly worse. He became delirious, cried out at intervals, and began to have convulsive seizures accompanied by cyanosis and unconsciousness. These convulsions occurred at three-minute intervals and began as follows: The eyes would roll upwards and the pupils became dilated and would not react to light. Twitching started about the mouth, extending over the face, and the arms were raised and held up in tonic contractions. The hands were flexed at the wrists, but the typical tetanoid position was not observed. The respirations were rapid at first, and then held for ten to fifteen seconds in full inspiration. Nearly all of the body muscles appeared to be affected; the abdominal muscles became taut and the head was slightly extended. The leg and thigh muscles appeared to be only slightly affected.

The patient was extremely cyanosed with each attack and the fingers and hands remained somewhat cyanotic following each seizure. Oxygen inhalations were given, with the idea of combating the extreme cyanosis, and appeared to have a decided effect in checking the convulsions. When the inhalations were stopped, the convulsions would recur, and in consequence the tube from the oxygen tank was placed in the nostril and held there with straps. His temperature was 101, pulse 120, respiration 24.

The urine was acid in reaction and was otherwise normal. The blood picture showed 3,530,000 red cells, 9300 whites, and 70 per cent. hæmoglobin; 10 small lymphocytes, 4 large lymphocytes and 86 polymorphonuclears. The blood sugar was 149; creatinine 1.5; uric acid 4.1; urea 47; bicarbonate CO_2 88 per cent., and calcium 12 mgms. It was unfortunate that an estimation of

the blood chlorides was not made. Glucose solution was given per rectum but was expelled. The sixth day following operation, the patient began to improve and retained small amounts of nourishment given by mouth. Two thousand c.c. of normal saline were given per hypodermoclysis.

Convulsions again began to recur, coincident with the supply in the oxygen tank running out, but when the oxygen inhalations were renewed, the convulsions again ceased. There was incontinence of urine and feces. The oxygen tube was removed on the seventh day, but the patient continued to have slight convulsions until the twelfth day following operation. Hiccoughing also occurred at intervals up to this time. During the course of his treatment he was given 8000 c.c. of normal saline solution per hypodermoclysis; also calcium chloride, ten grains intravenously for three doses.

A review of the history and symptoms in this case suggests that it is an example of the group of cases which are at present designated as cases of alkalosis. It corresponds in many respects to those which have been reported rather frequently in the recent literature under this name.

The sequence was as follows: A very large hernia which was reduced with considerable difficulty because of the many coils of small intestine in the sac; acute dilatation of the stomach which required prolonged drainage; generalized convulsions, but which were not particularly of the tetany type, accompanied by delirium, loss of consciousness and marked cyanosis; a high bicarbonate CO_2 content of the blood plasma.

This condition has been attributed by some to rapid extraction of the HCl from the economy through the gastric juice. It, perhaps, furnishes a warning against the too prolonged use of the Jutte tube in cases of acute dilatation of the stomach, in intestinal obstruction and peritonitis. We have used the Jutte tube very frequently and have been enthusiastic over the results obtained in the class of cases mentioned. We have also noted in one or two other cases, what we thought were slight unfavorable symptoms from the very thorough drainage which it affords. These might have been due to dehydration. We have never seen such symptoms approach the danger line before.

It has been stated in recent literature that a ketonurea was observed in certain tetanoid conditions, ascribed to an alkalosis, because of the high bicarbonate CO_2 content of the blood plasma. This should emphasize the necessity of a thorough study of the blood chemistry, particularly with reference to the bicarbonate CO_2 content, in these cases, as the condition may otherwise be considered an acidosis and the wrong treatment instituted.

OPEN OPERATION IN AN ADULT FOR IRREDUCIBLE FRACTURE-DISLOCATION OF THE HIP

DR. JOHN H. JOPSON described the history of a man, aged fifty-two, who was brought into the Polyclinic Hospital, November 11, 1924, with a history of having been injured in a street car accident. While getting off a street car, the car started, before he had alighted, throwing him to the ground and dragging him across the street. When admitted he was in a state of shock. His head and neck were negative except for a slight laceration of the nose. A few wheezing râles were heard on inspiration over both lungs. There was no cardiac enlargement and no murmurs were heard. His left leg showed limitation of motion at the left hip. The thigh was adducted and internally rotated and there was about $2\frac{1}{2}$ inches of shortening. There was considerable swelling and ecchymosis about the hip and thigh. The right leg was normal.

A röntgenogram showed the left femoral head dislocated upwards, and

OPEN OPERATION FOR FRACTURE-DISLOCATION OF HIP

apparently backwards. There also seem to be small fragments of bone present, which may be due to fracture. The neck seems normal.

Reduction was then attempted by Doctor Rothschild under ether anaesthesia, but was unsuccessful, and a Buck's extension was temporarily applied with sixteen pounds of traction.

Reduction was again attempted by Doctors Willard and Rothschild on December 2, but was unsuccessful. Röntgenographic examination at this time, showed that the head of the femur was displaced upward and posteriorly from the acetabular cavity, and that there was a fragment of bone, probably from the head, in the acetabular area.

December 7, he was transferred to the Medico-Chi Hospital, where reduction under anaesthesia was again attempted by Doctor Jopson but without success. Twenty pounds of traction with Buck's extension was then maintained until December 23, when open operation was performed by Doctors Jopson, Willard and Rothschild. The anterior aspect of the capsule was exposed by a sub-periosteal elevation of the glutei muscles. The capsule was opened by an anterior, external vertical incision and three fragments of bone, broken from the head, were removed. Two of the fragments were about 2 cm. in diameter and were lying comparatively free and covered by cartilage. The third fragment, about $4 \times 2\frac{1}{2}$ cm. in diameter, was included in the capsule. The rectus tendon was divided to facilitate exposure and reduction. The head of the bone was further exposed by retraction of the glutei. Doctor Willard then manipulated by the Bigelow method, with Doctor Jopson directly manipulating the head with skids. Two other assistants made forward pressure over the trochanter. The upper undivided fragment of capsule acted as a hamstring and had to be cut.

The head was brought to the posterior edge of the acetabulum by adduction and flexion and upward traction on the knee. The edge of the acetabulum resisted re-position until further downward traction on the leg and further forward pressure on the trochanter, caused the head to slip into the acetabulum. Three or four small vessels were tied and the capsule was sutured with interrupted chromic catgut stitches. The large wound was approximated with buried catgut and superficial sutures of silkworm gut. A large, fenestrated, split rubber tube was placed in the posterior part of the wound for drainage and a long padded board splint was applied to the trunk and leg.

The operation was well borne. There was moderate shock and camphor and strychnia were given for stimulation. The patient reacted well from the operation and from anaesthesia. On the following day his condition was good. There was a slight discharge of sero-sanguinous fluid from the incision. The drainage tube was removed on the sixth day. Sutures were removed on the eighth. The patient had no further pain in the hip and a re-X-ray showed perfect reduction. Extension was maintained for three weeks, reducing the weight gradually. He began to complain of severe pain in the posterior part of the left knee on the twelfth day. This condition was believed to be due to a "splint arthritis." The board splint was removed and a Thomas splint, with an attached leg piece, hooked up to a Balkan frame, was then used to permit exercise of the knee.

The patient was forced out of bed on the forty-first day (it was difficult to secure his coöperation) and massage treatment was instituted. At the present time he is able to be about on crutches. He has some oedema of the leg and foot, which is lessening and the knee motion is slowly improving. There is a slight ulceration of the heel. Hip motion is fairly good.

PHILADELPHIA ACADEMY OF SURGERY

DR. DEFOREST P. WILLARD remarked that the incision used in this case is one suggested by Dr. M. N. Smith-Petersen, of Boston, and is known by his name. It is used almost routinely in orthopædic surgery for exposure of the hip-joint. It consists of a reversed L-shaped incision beginning at the level of the lower border of the hip-joint, extending upwards along the outer edge of the rectus muscles to the anterior superior spine, then backwards for about four or five inches just below the iliac crest. Tensor fascia femoris and gluteal muscles are resected backwards and downwards sub-periosteally until the acetabular cavity is reached. The capsule can be opened either by incision along the neck of the femur or along the edge of the acetabulum. This incision gives excellent exposure to the hip-joint, and in such a case as that presented by Doctor Jopson, it is the only type through which results could be obtained.

DOCTOR JOPSON added that the result in this case still leaves much to be desired. The man is not young and they hesitated before resorting to the open method, but felt it was justified by his condition as he was hopelessly crippled. It was largely due to the wisdom and assistance of Doctor Willard that the operation was carried through and the reduction obtained. It took the combined efforts of four surgeons to lift the head over the posterior portion of the acetabulum. The exposure was ample. It has been difficult to get the coöperation of this patient and he is very easily discouraged; so much so that at times it has seemed as if we were making progress backward rather than forward. In describing the motion in the joint as fair, it is meant that it was about 20 per cent. He is still in the hospital, and under treatment by massage, etc.

DR. A. P. C. ASHHURST said that a good many years ago he assisted Doctor Harte at the Orthopædic Hospital in operating on a patient of this type. Doctor Harte excised the head of the femur and though this seemed rather radical treatment, the result was extremely satisfactory. The patient was above fifty years of age; he secured free motion, without pain, though of course with limp. The man returned to work and now is living on a ranch; he has been able to ride horseback and do just what he wants to for the last fifteen or eighteen years. Excision of the hip is a comparatively easy operation and it seems to have certain advantages, especially in elderly patients over open reduction of the dislocation, which may give a very prolonged convalescence, and leave the patient with a stiff and painful joint.

PERSISTENT FECAL FISTULA TREATED BY ILEO-CÆCAL RESECTION AND ILEO-COLOSTOMY

DR. JOHN H. JOPSON presented a man, aged forty-six, who was admitted to the Medico-Chirurgical Hospital, February 9, 1925, for study and possible operation for a fecal fistula. Previous to an attack of appendicitis in 1905, he had always been unusually healthy. Since that date he had had thirteen operations, the first two for suppurative appendicitis and the remainder for fecal fistula.

At the time of his original operation for an acute appendicitis, a few days

PERSISTENT FECAL FISTULA

later his abdomen was reopened to institute drainage. This was followed by an incisional hernia and a fecal fistula. He had several operations during the following years for adhesions. Operation again followed for incisional hernia and fecal fistula. This operation was unsuccessful and he had a two-stage operation performed in Rochester, Minnesota, for the cure of his hernia and fistula. The following year, he had a recurrence of the hernia with strangulation and was again operated, but had a recurrence of his fistula.

Two years later he had a further operation for adhesions, with good results, and his fistula closed for about two years. Three years ago there was a recurrence of the hernia, with strangulation, and he was re-operated. Four days after this operation, the wound broke down, with reformation of the fistula. The wound remained open for seventeen weeks, when an attempt at closure was made. Shortly afterwards, he noticed an opening in the incision, through which gas and feces escaped. Four months ago, there was a prolapse of the bowel through the fistulous opening and this occurs constantly.

The patient stated that when he was able to keep the bowel in the abdomen, he passed feces through the rectum, but when the bowel protruded, all of his feces passed through the fistula. His abdomen was rather obese and showed an operation scar, extending diagonally (about 30°) from the pelvis to the costal margin, spreading to a width of two inches over McBurney's point.

At the widest portion of the scar, there was an opening lined with mucous membrane, about 1 cm. in diameter, through which the bowel prolapsed for about three inches. The length of the prolapsed gut sometimes was considerably greater. Feces exuded through the opening.

Serial roentgenographic films made of the colon, outlined with barium, at the 15 and 24 hours in succession, revealed no X-ray evidence of fistula extending between any portion of the bowel, with special reference to the pelvic colon, nor into the peritoneal cavity. The cæcum was fairly, freely movable. The fistula was approximately 4 cm. above the cæcal tip. An opaque enema confirmed the above observation. This examination was made to determine whether any short-circuiting or resecting operations had been previously performed.

In a following study, barium was injected immediately through the fistula and, apparently, communication was directly into the cæcum. A plate was made fifteen hours later to determine if the bismuth moved with the normal colon channel, or if it was loculated. Subsequent examination showed that the bismuth was not loculated but was apparently free in the colon.

Under general anaesthesia, the fistula was first dissected free, down to the peritoneum and closed with a suture ligature. The peritoneal cavity was then opened and the fistulous opening, one cm. in diameter, and the bowel which prolapsed through it, was located in the cæcum. About three inches of the terminal ileum was then resected, together with the cæcum and the first part of the ascending colon. A lateral anastomosis between the ileum and ascending colon was made, and the defect in the abdominal wall, including a large incisional hernia, was repaired by layer suture. A cigarette drain was placed in the abdomen, down to the point of anastomosis. One thousand c.c. of normal saline solution were given per hypodermoclysis, during the operation, and camphor and digalen were given for stimulation. The patient reacted well, and his condition was good on the following day.

There was a slight serous discharge from the incision. The drain was removed on the third day. Three days after operation he had a liquid stool containing blood clots and some free blood. The wound healed by first

PHILADELPHIA ACADEMY OF SURGERY

intention, with the exception of a small opening, through which drainage was established. This area gradually filled in with granulation tissue. His convalescence was uneventful. He was troubled for a few days with a persistent diarrhoea. His wound has solidly healed.

The temptation was great to close the small opening in the cæcum and drop it back without resection, but the cæcum had probably been shortened by repeated suture operations and resection of the atrophied margins of the opening. The necessary inversion would have brought the suture line very close to the ileocaecal junction. The bowel wall was very thin at this point.

For this reason, and in view of the failure of repeated operations of the conservative type at the hands of skilful surgeons, determined the decision to resect the entire cæcal area.

RHINOPLASTY

DR. GEORGE M. DORRANCE presented a young woman to show progress in the construction of a new nose, for which his "peak roof" method had been used. He considered the result satisfactory. The girl has a fairly good-looking nose, through which she can breathe freely.

POST-APPENDECTOMY PYLEPHLEBITIS; WITH LIVER ABSCESS

DR. E. L. ELIASON reported the history of a boy, thirteen years of age, who was operated upon by him at the University Hospital for a ruptured gangrenous appendix. A spreading peritonitis had already developed. Drainage was instituted, and the usual technic for peritonitis inaugurated including an intravenous injection of 5 per cent. solution of gentian violet. The temperature dropped to normal on the third day, but fluctuated during subsequent days. On the ninth day a slight chill was felt. Temperature rose to 102. During the immediately following days evidences were noted of congestion in the right diaphragmatic region.

On the eighteenth day following operation it was noted that rigidity was present in the upper right abdomen. Tenderness to fist percussion over the liver. A very slight œdema was noted in the mid-axillary line extending over the eighth, ninth and tenth ribs. There seemed to be a slight engorgement of the superficial veins in this area. Palpation of the abdomen elicited a thick, irregular, doughy feeling. No fluid could be demonstrated in the flanks. Widal hæmoclastic crisis test indicated a reduction in hepatic function, and an intra-hepatic collection was suspected clinically in the right lobe, although the X-ray revealed a high fixed diaphragm on this side. A needle was introduced in the anterior axillary line between the ninth and tenth ribs. It was directed downward into the liver and pus was withdrawn. Resection of a piece of the ninth rib was performed. The parietal pleura was stitched to the diaphragm around the needle which was left *in situ*. An actual cautery was then passed down along the needle and an opening the size of one's thumb cauterized into the abscess cavity, which contained from two to three ounces of thick yellow pus. The patient's temperature promptly dropped to normal and remained there. A bismuth preparation was injected into the abscess cavity, which X-ray plates revealed to be within the liver. The patient made a subsequently uneventful recovery and left the hospital just one month from the day of admission.

DR. CHARLES F. NASSAU remarked that in cases of death from an appendix case in which secondary liver abscess had formed, it was the rule to find at necropsy, that the septic condition of the liver started with multiple

DIVERTICULA OF THE JEJUNUM

abscesses, which rarely break down to single abscesses before death. This is obvious to those who have had subphrenic abscess cases which were diagnosed as liver abscesses, the differential diagnosis being extremely difficult. If the abscess is amoebic, the formation of a single abscess is probable.

DR. A. P. C. ASHHURST favored the suggestion of Doctor Nassau that Doctor Eliason's case is one of subphrenic rather than of hepatic abscess. In 1900, Loison, a French surgeon, reported 12 fatal cases, and one recovery, after operation for hepatic abscess following appendicitis; but in the discussion of this report Tuffier said that he thought the facts presented were not sufficient to justify the diagnosis, and that the cases reported were instances of subphrenic abscess. Even before that date, however, Loison pointed out that Körte, in 1892, had recorded a successful operation for an abscess of the liver secondary to appendicitis. Moreover, in 1911, Quénu and Mathieu collected reports of operations on 14 such patients, with only 2 deaths; they said that in these very exceptional cases of operation for this complication of appendicitis, either single abscesses had been present in the right lobe of the liver, or, that multiple abscesses had fused or were readily drained through a single opening. So that it must be admitted that such cases though rare, may occur. But in Doctor Eliason's case the facts he has so far mentioned in his brief verbal report of the operation leave the exact situation of the abscess in doubt.

DOCTOR ELIASON rejoined that this abscess was in the liver. When the chest was opened near the lower end of the pleura, he could see when he opened into the diaphragm that the liver was free underneath it. The abscess was in the liver substance one inch away from the diaphragm; also the X-ray and the use of the bismuth preparation proved this was so. He had had two other cases in the last year that looked like simple single liver abscess, both of which were diagnosed liver abscess, and at operation an abscess in the lower surface of the liver was opened and drained. Unfortunately neither one of these cases was post-mortemed, so they may have had other abscesses as stated by Doctor Nassau.

LENGTHENING THE SOFT PALATE IN OPERATIONS FOR CLEFT PALATE

DR. GEORGE M. DORRANCE read a paper with the above title, for which see page 208.

DIVERTICULA OF THE JEJUNUM

DR. NORMAN P. ROTHSCHILD (by invitation) read a paper with the above title, for which see page 250.

CORRESPONDENCE

CURE OF INTESTINAL FISTULA NEAR THE DUODENO-JEJUNAL JUNCTION

EDITOR ANNALS OF SURGERY:

Sir:

In an intestinal fistula, not far from the duodeno-jejunal junction, besides the difficulties encountered in keeping the skin surface in the neighborhood of its external orifice free from the excoriations attendant upon the discharge of contents rich in digestive juices, there is also the more serious problem of maintaining nutrition in the face of a continuous escape of ingesta before any appreciable amount of absorption can occur. Frequent changes of dressings fail to keep the wound clean. The application of protective pastes to the skin surface are of little value. In a comparatively short while the skin exhibits an angry, red, excoriated appearance which becomes progressively worse. As a direct result of the presence of the gastric, intestinal, biliary and pancreatic secretions in the discharge, there is no tendency towards spontaneous healing, the usual course being rather progressive enlargement of the fistula.

Frequently, complicating the fistula, or responsible for it, is a local sepsis of variable extent and virulence. The presence of infection diminishes the expectation of the success of any radical operative procedure to close the fistula. The patient rapidly loses weight, becomes progressively weaker as a result of inanition, and in a very short while, if no check to the progress of the debility can be instituted, the physical condition is so poor that even with the sepsis controlled, any operative risk is exceedingly hazardous.

Rectal feeding and intravenous administration of glucose are of little value. The establishment of an enterostomy below the fistula through which nutrition can be maintained is much more valuable. The most effective means for combating the progress of inanition is unquestionably restitution of the continuity of the intestinal tract. In illustration of how this may, in some cases, at least, be quickly accomplished, even in the face of considerable infection, the following case is reported: A woman, aged forty-six years, was admitted to the Brownsville and East New York Hospital, January 6, 1923, complaining of severe abdominal cramps, vomiting and a protruding umbilical hernia which had been present for six years. Symptoms of strangulation had been present for about twelve hours. She was very obese, weighing 230 pounds. Upon operation the contents of the sac were found to be chiefly omentum (very fatty) and intestines, one loop of which was blue black; but peristalsis soon returned in this after the constricting ring had been divided. A mass of gangrenous omentum was excised. The operation was concluded with a Mayo hernioplasty and closure without drainage.

CORRESPONDENCE

The patient was returned from the operating room in good condition and ran an ordinary post-operative course for the first six days. Then suddenly she became cyanotic, dyspnoëic, incontinent and developed moist râles all over the chest. The heart showed signs of dilatation. Digitalis and atropine controlled the condition, the chest signs receded and the patient again became comfortable. The temperature on the twelfth day, however, began exhibiting a fluctuation which continued daily, ranging from 99° in the morning to $102-103^{\circ}$ in the evening. The wound was clean. On the sixteenth day a hard, indurated mass began making its appearance in the median line of the abdomen, about two inches above the level of the operative wound. It was very tender but not fluctuant. The mass persisted, becoming gradually more superficial. Finally on the twenty-fourth day after operation the patient had a severe chill lasting fifteen minutes and the temperature rose to 105° . She was taken to the operating room and a vertical incision made in the median line beginning 3 inches above the original horizontal incision and extending down to it, incising through at least 4 inches of fat to the fascia and after that, into a large cavity containing approximately one-half pint of sero-purulent fluid. After the fluid was evacuated, material which had the appearance of intestinal content was discharged in little gushes from the bottom of the cavity. Cigarette drainage was instituted and the patient returned to bed. The following day there was no difficulty in recognizing that an intestinal fistula was responsible for the discharge. Charcoal was found in the discharge, fifteen minutes after ingestion, which indicated that the intestinal lesion was not far below the duodeno-jejunal junction. The patient continued to run a mildly septic course, continued discharging all ingesta and began exhibiting an exceedingly rapid loss of weight. Rectal feeding was apparently of no value. The patient could be seen to be losing weight daily.

After nine days of ineffectual temporizing the base of the wound was thoroughly explored and the proximal and distal limbs of the fistulous loop located. A piece of glass tubing was bent into a horseshoe shape to conform to the angulation necessary to bridge the gap between the lumen of the two loops without placing undue tension on their walls. Short pieces of rubber tubing were attached to the limbs of this glass tube. The free end of one was inserted into the proximal loop and the free end of the other into the distal loop. There was then a patent artificial bridge across the gap between the fistulous loops. This bridge lay at the bottom of the wound, now about three inches from the skin surface. To diminish leakage, zinc oxide ointment was spread around the connections and the wound tightly strapped over a gauze sponge.

It was quickly noted that the drainage diminished, bi-daily dressings being now sufficient. Intestinal contents were absent from the discharge which assumed a definite purulent character. An enema given the day following the introduction of the bridging-tube showed formed fæces in the return.

CORRESPONDENCE

This was the first effectual return of any enema given since the development of the fistula.

From then on, there was a rapid general improvement in the condition of the patient. The temperature declined to normal, the discharge from the wound kept diminishing, and the wound surfaces began granulating in. Nutrition rapidly improved, the loss in weight ceased, and health and strength began returning.

Granulations filled in the space between the arms of the glass tube and began growing over its external surface. On the twenty-fifth day after the introduction of the glass tube, the granulations had grown so profusely around the bridge that it was withdrawn with considerable difficulty. The skin edges were firmly approximated by adhesive strapping and the upper part of the wound closed in rapidly, leaving a patent canal between the two loops through which there continued the unobstructed passage of intestinal content. On the 11th day of March the patient was discharged with a healed wound, sixty-five days after admission, forty-one days after the establishment of the fistula and thirty-one days after the introduction of the glass bridging-tube.

On examination two weeks after discharge, her general health was improved, and her weight had increased. She had a large ventral hernia for which a support was prescribed. Her general health has been uniformly good with the exception of an attack of severe abdominal cramps accompanied by constipation and vomiting which occurred in January, 1925. The impression was that the condition was one of acute intestinal obstruction because, associated with the subjective signs was a small mass in the region of the healed fistula, and visible peristaltic movements. However, colonic irrigations and enemata gave relief and operation was deferred.

The intestinal fistula developed, probably as the result of subsequent ulceration and necrosis of the incarcerated loop which at operation had been judged to have been viable. The fistula was high up in the intestinal tract, the discharges were very irritating. The artificial bridging of the intestinal tract was intended as a temporary, inanition-relief measure to be used only until the sepsis would diminish and the patient would become a better operative risk. The results were so gratifying and the improvement so progressive that by the described modification of the original plan, the fistula was healed without resort to further surgery.

HARRY KOSTER, M.D.,
Brooklyn, N. Y.

TORSION OF THE GREAT OMENTUM

EDITOR ANNALS OF SURGERY:

Sir:

UP TO 1915, one hundred and thirty-one cases of torsion of the great omentum were found by Bookman to be recorded in the literature.

CORRESPONDENCE

There is no pathognomonic sign or symptom by which such a condition can be recognized with certainty. The suggestive symptoms, if one has this condition in mind, are vague abdominal pains, aggravated by exertion; relieved by rest; a feeling of an indistinct mass moving about in the abdomen; nausea or vomiting, occurring in the middle aged. In view of the vagueness and uncertainty of the symptoms attending this condition, a report of another carefully observed case may be instructive.

CASE REPORT.—A. C., male; age twenty-eight years. Was never sick before in his life except for a few attacks in the past year of vague abdominal pains, which would last for about an hour or less.

Present complaint, May 31, 1925, on rising he complained of vague abdominal pain, but he went for a boat-ride for the entire day. He ate little while on the boat, because of the abdominal discomfort. The discomfort and pain were aggravated while he was walking about, but would be relieved while sitting down. He returned home at 11 P. M. and took a bottle of magnesia, after which he vomited twice. During the night he complained a few times of some pain. When he arose in the morning he began to complain of severe abdominal pain and some nausea. Pain was at first in the upper part of the abdomen, and in the course of a few hours shifted down below the umbilicus and to the right. At 2 P. M. when first seen by the writer in consultation, his pulse was 110; temperature $100\frac{1}{2}$; respiration 28. Blood and urine examination negative. Abdomen rigid and tender all over but more marked and board-like over the upper right rectus. No particular tenderness over McBurney's point. A right indirect inguinal hernia with a ring, admitting two fingers; impulse on coughing; sac small size. Right testicle could not be found in scrotum or elsewhere.

The patient was admitted to the United Israel Zion Hospital and operated on by the writer June 1, 33 hours following the onset.

Through a right rectus incision the peritoneum was exposed; was found to be cedematous and of dark color; when opened, copious bloody fluid escaped. The omentum presented itself at the wound and was of a brawny purplish color. The incision was enlarged upwards and the hand was introduced into the abdominal cavity. A mass the size of a large fist could be felt just below the stomach. The mass was continuous with the presenting omentum. The condition was then recognized as torsion of the large omentum. When the mass was delivered, it was found to consist of the omentum twisted on itself six times. The proximal upper half was strangulated, cedematous and about two inches in thickness, black in color. Clamps were applied at that margin and omentum excised. Separate ligatures were used for the cut edge of the omentum so as to avoid kinking or twisting of the colon. Condition of patient remained good. The appendix was found thickened with a short meso and was removed. The testicle could not be felt intra-abdominally or in the inguinal canal. The omentum appeared at no time to be in any way adherent to the hernial sac. It was, however, elongated, which may have predisposed it to torsion. The abdomen was closed without drainage. It was not deemed advisable to repair the inguinal hernia at the same sitting. The patient had no complications and made an uneventful recovery. The torsion, strangulation, thickening and swelling of the omentum was most marked in its proximal half. The distal half was free and could be readily untwisted. The veins in the distal portion were cord-like and the thickness of a lead pencil. The anterior and posterior layers of the omentum could readily be separated, clearly showing the lowest recess of the lesser peritoneal cavity. The entire large omentum was involved and removed. It measured about two feet in length, twelve inches in width. The proximal portion was about two inches in thickness.

JACOB SARNOFF, M.D.,
Brooklyn, N. Y.

NOTE ON THE TREATMENT OF ABDOMINAL SEPSIS

EDITOR ANNALS OF SURGERY:

Sir:

Excepting in some cases of tubercular peritonitis, I do not employ general irrigation during operation in septic abdominal conditions as I am possibly obsessed with the dread of diffusing septic elements. Instead I rely on thorough mopping up with large dry bibules. I then introduce two or three rolls of iodoform gauze which are carefully placed in the maximum septic zone. In abdominal infection it is most essential to provide ample room for free exit of secretion. I have for some years past been gradually forced to the conclusion that while we require large tunnels for efficient drainage of septic compound fractures, etc., we require an open chasm for effective drainage in intra-abdominal suppuration. I do not know of anything which has sent more people to a premature grave as the sense of security engendered in the surgeon by ill-considered, inefficient drainage, not to add the ghastly error of expecting the ever-friendly peritoneum to do the impossible, *viz.*, to remove by absorption, toxic material from an abdomen of a body saturated with general septicæmia.

I am convinced that we should hear much less about the "wait and see until things settle down" (after the first twenty-four hours) treatment in appendicitis if surgeons would abandon the employment of drainage tubes in abdominal surgery and instead would substitute (a) leaving the parietal wound temporarily open, but introducing for its subsequent closure interrupted through-and-through double silkworm gut "waiting" sutures, knotting or ligating ends of same to prevent their slipping out; (b) then packing the septic cavity with rolls of gauze well wrung out in freshly prepared iodoform emulsion, and, subject to the amount of peptonization, leaving same in position for one to three days. After this, when the flow of pus is established, dispensing with gauze packing and uniting as much of the parietal wound by the "waiting" sutures as may be reckoned judicious, *i.e.*, leaving sufficient (visible) opening for free drainage without, if possible, entailing over-exposure of the adjacent intestines. I have found that, in cases treated in this manner after the fourth day, low level, gentle irrigation, of the septic space around which encircling protective adhesions, as a rule, have by this time formed, with peroxide carbolic lotions, rapidly overcomes fætor, and, in conjunction with perchloride of mercury fomentations, by the fourteenth day induces a clean granulating wound.

In abdominal surgery the question constantly arises, shall I drain or not? Personally, I have not had occasion to regret having done so, but now and then have had bitter reflections for its omission.

I am quite aware that leaving an abdomen open is not artistic surgery but am equally cognizant of the fact that closure of a peritoneal cavity in which there exists a reasonable possibility of subsequent sepsis arising is an unworthy act. I make it a rule in this contingency to pack a bibule into the suspect area while I insert the interrupted silkworm gut sutures and then

CORRESPONDENCE

before partially closing the parietal wound an assistant retracts the edges of latter while I remove the bibule and introduce a stout wisp of silkworm gut, in plain sight, into the suspect fossa at a point corresponding to the site of the primary lesion. This I reckon a vital manœuvre, as I have seen, more than once, death follow the introduction of drains which did not touch much less drain the dangerous zone. It is easy to visualize that, if a coil of intestine or plug of omentum should intervene between the drain and the objective, if sepsis ensues, a tragedy is probable.

Tier sutures should not be employed to close the parietal wall in any suspect septic case. When the wisp is removed on the fifth or sixth day and sepsis has not taken place, the corresponding portion of wound is united by its "waiting" suture. I have frequently obtained prompt aseptic secondary union after such use of a wisp, but never after that of a rubber tube.

For promoting the aseptic union of abdominal parietal wounds, after the peritoneum has been closed by a continuous catgut suture, I place a six-strand wisp of silkworm gut between the peritoneal and rectal sheath layers. The rectal sheath is then similarly united, the ends of the wisp emerge at each angle, and similarly are made to extrude through the angles of sutured skin and subcutaneous layers.

We have been frequently surprised at the quantity of serum which subsequently exudes alongside of this wisp. So far it has materially assisted in the aseptic union of all wounds in which it has been tried. When the serous oozing ceases (sixth to tenth day) the wisp is removed.

JOHN O'CONOR, M.D.,
Buenos Aires, Argentina.

BOOK REVIEWS

FRACTURES AND DISLOCATIONS; IMMEDIATE MANAGEMENT, AFTER-CARE, AND CONVALESCENT TREATMENT, WITH SPECIAL REFERENCE TO THE CONSERVATION AND RESTORATION OF FUNCTION. By PHILIP D. WILSON, Instructor in Orthopædic Surgery, Harvard Medical School, and WILLIAM A. COCHRAN, University Tutor in Clinical Surgery, University of Edinburgh. Octavo, 806 pages. Philadelphia and London, J. B. Lippincott Co., 1925.

This is a well-written, well-illustrated treatise on Fractures and Dislocations. The first three chapters are taken up with the principles of treatment, emergency splinting and the treatment of compound fractures and dislocations. A wealth of practical information is contained in these pages. The authors have selected the best of the older methods, combed out the essential principles from the mass of war material, simplified them and made them accessible for civil practice. In doing this they have shown sound judgment. We believe that the value of these three chapters would have been enhanced by a note of warning on the dangers and drawbacks of the different forms of splinting employed for transportation of the wounded. As evacuation officer for the wounded of the First Army we had, unfortunately, ample opportunity to realize that these dangers were not always appreciated. The advantages of the suspension treatment in suitable cases are well stated. Figure 4 illustrating the method of suspension in a "Balkan" frame, although taken from the "Outline of Treatment of Fractures," Archives of Surgery, violates some of the essential points of traction and balanced suspension. In the legend and text we find the misnomer "Balkan Frame."

The body of the book is devoted to the treatment of the individual fractures and dislocations. The chapters open with a brief anatomical and physiological review of the region under consideration. The value of the review is increased by the well-selected anatomical plates and diagrams. Such knowledge is essential to the proper understanding of the problems connected with fractures. Without it the employment of traction and suspension in the physiological treatment of fractures is just an empty form of going "through the motions."

Chapters IV to IX are devoted to the upper extremity. The treatment advocated is practical, well balanced and based on the sound principles of prompt anatomical reposition and early functional use. Chapter IX on injuries of the wrist and hand contains a wealth of practical detail. The authors are liberal minded regarding the choice of position in the treatment of Colles' fracture. They employ the cock-up position in the cases where protection alone is needed; in displaced fractures without much comminution or without a tendency to recurrence a moderate palmar flexion; in the severe cases the Cotton-Loder position.

Chapters X to XII are devoted to the vertebral column and to the bones of

BOOK REVIEWS

the face and thorax. The chapter on the vertebral column is a well-rounded exposition of a difficult subject. The chapters on injuries to the bones of the face are not very full, but the methods described are well within the ability of the general practitioner. It is to be regretted that fractures of the skull have been omitted, this we believe to be a mistake. The increasing number of automobile accidents occurring throughout the country has raised the incidence of these lesions in general practice.

Chapters XIII to XIX are devoted to the injuries of the pelvis and lower extremity. In the fractures of the neck of the femur the authors advocate the Whitman abduction method as the routine treatment. In the operative treatment of ununited fractures of the neck of the femur no mention is made of Albee's reconstruction operation. We believe this operation has given some excellent functional results and should be considered.

The section on the lower extremities is thorough and embodies the best surgical teaching of the day. Special attention has been paid to the after-care of these fractures and emphasis laid on the necessity of protection, maintenance of alignment and early functional use. Precise directions are given for the accomplishment of such results.

HENRY H. M. LYLE.

THE CRIPPLED HAND AND ARM. A monograph on the Various Types of Deformities of the Hand and Arm as a result from Abnormal Development, Injuries and Disease, for the Use of the Practitioner and Surgeon. By CARL BECK, M.D. Octavo, 243 pages. Philadelphia and London, J. B. Lippincott Co., 1925.

Comprehensive surgical treatises on the hand have appeared but rarely. There are numerous monographs on special subjects relating to the hand. Excellent as they are, there is an urgent need for a work like "The Crippled Hand and Arm." The hand is such a complicated organ and the functional and anatomical relationship of the structures are so intimate that it is rare to have but one structure involved in a disability. As a rule we have to deal with combinations rather than with individual lesions. This fact is the keynote of the value of Doctor Beck's work. He has coördinated the different methods of treatment and shown us how to handle combinations of lesions. The work is particularly rich in plastic restorations and contains many new and novel suggestions. A large portion of the book consists in a record of personal experience in solving the many intricate problems which arise in the reconstructive surgery of the hand. With very few exceptions the illustrations are original. They depict the surgical problem to be solved, the method of solving it and the result obtained. The majority of illustrations are photographs but numerous detailed drawings are inserted to show the surgical procedure.

HENRY H. M. LYLE.

APPLIED ANATOMY. By GWILYM DAVIS, late Professor of Orthopædic Surgery, University of Pennsylvania. Revised by GEORGE P. MULLER, Professor of Clinical Surgery, University of Pennsylvania. Sixth edition,

BOOK REVIEWS

octavo 638 pages. Philadelphia, London and Montreal. J. B. Lippincott Co., 1924.

The surgical profession welcomes the appearance of a new edition of Davis' *Applied Anatomy*. This unique book has become to the surgeon what Gray's anatomy was to him in his student day—a guide and an ever-faithful helpmate. Professor Muller has carried out his revision so skilfully that none of the essentials of the former editions have been sacrificed. Although much new matter has been added, the sixth edition contains only a few more pages than the fifth.

The additions consist chiefly in fuller descriptions of the modern surgical procedures and in the insertion of numerous helpful illustrations. The choice of the operations, their terse descriptions and sound advice makes this edition especially valuable. We believe that if every general practitioner would consult this work before witnessing an operation, he would have a much better idea of the advantages and limitation of the different surgical procedures.

Beside maintaining the high standard of illustrations set by the former editions, many new and useful plates have been added.

We commend this excellent book to the student, the surgeon and the general practitioner. Within its covers each will find help in solving his individual anatomical and surgical problems.

HENRY H. M. LYLE.

MODERN OPERATIVE SURGERY. Edited by H. W. CARSON, F.R.C.S., Senior Surgeon to the Prince of Wales' Hospital, Tottenham. London and New York, Cassell and Co. In two volumes, octavo.

In these two volumes Mr. Carson has endeavored to present a description of modern operative procedures over the whole field of surgery, including the special branches such as gynæcology, the eye, ear and nose. He has been aided in the task by more than twenty surgeons writing upon those branches of the subject in which their names are household words. Throughout the book, an attempt has been made to confine the procedures described to those operations of proved value and general acceptance, and others of classical interest only have been ruthlessly discarded.

The subject has been divided into chapters of varying scope, thus some deal with the surgery of one or other system, for example, the vascular system or joints, others with individual diseases such as cancer of the large bowel and appendicitis, and others again with single organs or anatomical regions, as, for instance, the spleen, biliary passages and the neck. This arrangement, whilst appearing to lack method, has certainly allowed Mr. Carson to make the best possible use of the special knowledge of his collaborators.

Mr. Carson is to be specially congratulated upon the uniformity in style of the contributions from so many authors, a tribute to the care with which his editing has been done. In almost each chapter there is added to the description of the operations themselves useful information on the indications for the procedure, warnings as to special dangers and difficulties, some indi-

BOOK REVIEWS

cation of results collected either from the authors' own statistics or those published by large surgical clinics.

The printing and reproduction of the illustrations is excellent throughout, and the general style of the volumes gives them the appearance of companion books to the recent edition from the same publishers of Choyce's *System of Surgery*.

Outside the immediate scope of the book there is a chapter on anæsthetics by Mr. Blomfield which, if included at all, might well have been longer, and have dealt a little more fully with modern advances in local anæsthesia; one on "Conservative Treatment of Surgical Tuberculosis," by Sir Henry Gauvain, which certainly could ill be spared, and a third by Mr. Sampson Handley on the "General Principles Underlying the Surgery of Malignant Disease."

Mr. Elmslie writes on General Orthopedics, Operations on Tendons and on Amputations. He confines himself in the main to a description of actual operative technic; one is a little surprised to find that in the latter chapter he includes descriptions of such amputations as Chopart's and Lisfranc's, which hardly merit a place in a book which definitely sets out to discard the classical and retain only what is up to date.

The chapter on fractures is contributed by Mr. Hey Groves; he writes with his accustomed clearness descriptions of those operations for bolting and plating fractures, and their treatment by bone grafts which he has done so much to systematize. The numerous excellent illustrations add greatly to the usefulness of the text.

Mr. Richard Warren includes in his chapter on the surgery of the thorax, paragraphs on the treatment of injuries of the diaphragm, the treatment of diaphragmatic hernia and transpleural laparotomy.

Mr. Walton's first contribution is on operations on the spinal cord, one of the best illustrated in the book. He also contributes an excellent chapter on the Thyroid, and finally deals with the difficult conditions of Abdominal Ptois and Intestinal Stasis. Although he describes in detail the many operations which have been practised in recent years for the relief of these two conditions, he is very definite in his views as to their limited application, and the great care necessary in the selection of suitable cases. He suggests that many of the good results claimed are to be attributed more to the success of a striking line of treatment by suggestion than to the mechanical results effected.

Mr. Harry Platt contributes a chapter upon operation upon nerves, the value of which is greatly enhanced by the careful anatomical and pathological sections which he incorporates.

Mr. Sampson Handley writes upon surgery of the breast. The operation for carcinoma of this organ that he describes is based not alone upon his fundamental pathological work on this disease, but upon his very wide clinical experience and sets a very high standard indeed. To his safe hands is entrusted also a description of operations for Melanoma and

BOOK REVIEWS

Rodent Ulcer, and here again one meets with the same thorough surgical application of pathological knowledge of the diseases in question.

Mr. Grey Turner contributes a most excellent chapter on the surgery of the liver and biliary passages, clearly written, well illustrated, and complete in its scope. This chapter can be recommended as an absolutely safe guide to young surgeons in this field, and will be read with interest, and, one may almost hazard, enthusiasm, by those of longer experience.

Mr. Carson himself deals in many separate chapters with most of the abdominal surgery, and maintains a uniformly high standard throughout. He has been fortunate in being able to incorporate in his chapter on the stomach a verbatim description by Sir Berkeley Moynihan of his operation of partial gastrectomy, and in the chapter on treatment of carcinoma of the rectum, a description of the abdomino-perineal removal is contributed by Mr. Miles. One almost feels that these two contributions would justify the inclusion of Mr. Miles' and Sir Berkeley's names in the list of authors.

Surgery of the genito-urinary tracts is dealt with by Sir John Thompson Walker and Mr. Everidge; the former's writings on this subject are so well known and so widely accepted that it is hardly necessary to state that this section of the book is one of the most satisfactory.

Mr. Giles deals with gynecological operations, and has compressed into 70 odd pages an amazingly complete survey of the whole field.

Mr. Harmer writes on operations on the nose and pharynx, and Mr. Brewerton on operations on the eye. These chapters, like those on the ear by Mr. Richard Scott, and on the larynx by Mr. Bedford Russell, are necessarily somewhat compressed, but they are all well illustrated and well adapted to widen the usefulness of the book for those surgeons who from time to time have to practise in these special fields.

There can be no question that Mr. Carson has succeeded in producing a most useful book, which will be read doubtless mostly by young surgeons in place of the more voluminous works on operative technic, and they will find in it not alone a safe guide as to the operations which now hold the field, but the kind of description which will best help them to tackle their work for the first time with confidence. The volumes will also have a value as a reference book for older men, and one anticipates rapidly recurring editions if it is to remain, as it stands at present, a record of the best surgical procedures of the moment.

E. P. G.

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Remittances for Subscriptions and Advertising and all business communications should be addressed to the

ANNALS of SURGERY

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Philadelphia, Penna.